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*J. B. Jeffery*

Manual  
of  
**ELECTRICAL  
REQUIREMENTS**  
for  
Hazardous  
Locations

Bulletin 2560

**CROUSE-HINDS**







# Manual of Electrical Requirements For Hazardous Locations

An analysis of Article 500 of the 1940  
edition of the National Electrical Code

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# Manual of Electrical Requirements For Hazardous Locations

## CHAPTER I

### General

**D**URING recent years the need for a better and safer type of electrical installation in the hazardous industries has been asserting itself very forcibly. Electrical apparatus and wiring which are considered safe for ordinary application have shown themselves unfit for installation in locations where flammable gases, vapors, dusts, and other easily ignitable flammable materials are present.

Conditions have been considerably aggravated during the past decade by an increasing use of materials known to be hazardous. New materials and methods have been found for the application of finishes to automobiles, furniture, and other manufactured articles; but unfortunately many of the materials, as well as the methods used for their application, introduced unusually severe hazards. Gasoline and other petroleum products of a highly flammable nature have found wide use in industry and commerce. Pyroxylin and compounds of which it is a part have come to be used for many purposes. The chemical industry has learned the secrets of producing many substitutes for natural commodities by synthetic means, often entailing the use of hazardous materials and processes. Industries producing flammable dusts have become more numerous and greater in extent.

Such increased production and use of hazardous materials have been attended by numerous fires and explosions, and in many instances electric arcs or sparks have been the igniting medium. It should be remembered that, due to the nature of the hazardous materials, it is frequently difficult to determine even the approximate causes of fires and explosions which occur in plants where such materials are present. Very often eye witnesses are killed or are so badly injured that little can be learned of the causes and conditions which brought about the explosion or fire. Furthermore, in the more serious accidents all material evidence is generally destroyed, with the result that the fire or explosion must, for want of definite evidence, be classed by investigators as being from some unknown cause. However, elsewhere in this chapter will be found several abbreviated reports of typical fires and explosions which have occurred in the hazardous industries through electrical causes. While these are but a few of a large number which might be detailed, they should be sufficient to prove conclusively that very special and individual treatment is needed for electrical installations in these hazardous industries.

In the study leading to the formation of the present Article 500 of the National Electrical Code it became

apparent that it was necessary to prescribe the proper forms of apparatus and wiring to suit the particular hazardous condition to which they would be exposed. It was recognized, for instance, that an enclosed motor which by test was found to be safe for installation in an atmosphere of combustible dust would probably be unsafe for operation where flammable vapors or gases were present. Conversely, while an enclosed motor designed to operate in an atmosphere of flammable vapor and air might be safe for use in a dusty atmosphere, it seemed unfair, in the interests of economy, to require a motor designed to a more rigid standard than was actually required.

It was necessary, therefore, to study the nature of the various types of hazardous materials and, if possible, arrange them into classes based on similarity of characteristics.

A survey of the field of commerce and manufacture revealed that the various forms of hazardous matter could be grouped into the following general types:

1. Flammable liquids, which may be divided into two classes, viz:
  - (a) Volatile flammable liquids which give off flammable vapors at ordinary temperatures.
  - (b) Relatively non-volatile flammable liquids which give off



flammable vapors only at temperatures in excess of those ordinarily reached.

2. Flammable gases which form flammable or explosive mixtures with air.
3. Highly flammable solids.
4. Highly flammable mixtures which combine a material in one of the foregoing classes with a non-hazardous substance, as in the case of rubber cement; or a combination of two or more materials of the same or separate foregoing classes, as in the case of pyroxylin lacquer.
5. Combustible dusts which may be either carbonaceous or metallic in nature, either in themselves easily ignitable or capable of forming explosive mixtures with air.
6. Easily ignitable combustible lint, fibers, or "flyings."
7. Combustible light material such as wood shavings and paper cuttings.

It was found that the locations where these various types of hazardous materials were involved could, for our purposes, be grouped into four classes and each treated separately. In Sections 5005 to 5008 of the National Electrical Code we find these four classes defined as follows:

Class I locations are those in which flammable volatile liquids, highly flammable gases, mixtures or other highly flammable substances are manufactured, used, handled or stored in other than their original containers.

Class II locations are those in which (1) combustible dust is thrown or is likely to be thrown into suspension in the air in sufficient quantities to produce explosive mixtures or (2) those where it is impracticable to prevent such combustible dust from collecting in such quantities on or in motors, lamps or other electrical devices that they are likely to become overheated because normal radiation is prevented.

Class III locations are those in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured or used and which are hazardous through such fibers or flyings collecting on or being ignited by arcing contacts, resistors, lamps or similar apparatus.

Class IV locations are those in which easily ignitable combustible fibers are stored and handled (except in rooms where in process of manufacture) and which are hazardous through such fibers being

ignited by arcing contacts, resistors, lamps or similar apparatus.

It is acknowledged that in Classes III and IV the materials involved are very similar in nature, but it will be noted that Class IV deals only with the storage of combustible fibers. The rules of this class apply principally to large combustible fiber warehouses where special conditions prevail.

Closely associated with the hazards of the materials themselves are the processes or methods by which they are used. To illustrate, let us assume a typical case of a varnish or a lacquer in which a highly flammable liquid is used as the vehicle. Such a material, if in closed containers, could, under ordinary circumstances, be stored with safety on the shelves of a paint store, but a considerable hazard is introduced when the same material is applied by the spray method to furniture or other manufactured articles, unless proper precautions are taken. Thus, a study of the processes involving the various hazardous materials and the methods by which they are manufactured and used was an important step in the formation of Article 500.

It would obviously be impracticable to include in Article 500 a complete list of the types of factories or buildings which produce, use, or otherwise handle the various hazardous materials we have discussed and to attempt to define the extent of the hazardous area in each. As a guide, however, several types of establishments in each class are to be found in the fine print notes following the definitions of the various classes in Sections 5005 to 5008, as follows:

Class I. This class may include such locations as some parts of dry-cleaning and dry-dyeing plants, pyroxylin plastic manufacturing plants, spray-painting establishments, flammable-gas plants, varnish-manufacturing plants, distilleries, rectifying and blending plants producing whiskey and other alcoholic beverage liquors, plants producing industrial alcohol, and establishments or industries involving similar hazardous processes or conditions.

Class II. This class may include such locations as some parts of flour mills, feed mills, grain elevators, starch plants, sugar, cocoa, and coal pulverizing plants, and establishments or industries involving similar hazardous processes or conditions.

Class III. This class may include locations such as some parts of cotton and other textile mills, combustible fiber manufacturing plants, cotton gins, clothing manufacturing plants, cotton-seed mills, woodworking plants, and establishments or industries involving similar hazardous processes or conditions.

Class IV. This class may include locations such as warehouses in which are stored or handled combustible fibers, such as cotton (including cotton linters and cotton waste), sisal or henequen, ixtle, jute, hemp, tow, cocoa fiber, oakum, baled waste, kapok, Spanish moss, excelsior and other similarly readily ignitable fibers.

The desirability of this grouping of hazardous materials has been proved by subsequent developments and tests. It was found, for instance, that motors, controllers, and similar equipment intended for Class I locations must be of the explosion-proof type while those for Classes II, III, and IV locations are required to be of the dust-tight type. An explosion-proof enclosure is not necessarily dust-tight, and therefore, Class I apparatus is not to be considered approved for Classes II, III, and IV locations unless it has been specifically tested and listed for installation in these locations. Conversely, Class II equipment, while approved for Classes III and IV locations, is not approved for Class I locations. The requirements for apparatus for each Class of location will be fully discussed in later chapters.

The authority enforcing the Code is definitely charged with the responsibility of determining the existence and extent of the hazardous area. This fact is clearly indicated by the introductory rule of Article 500 which states:

The provisions of this Article apply to locations in which the authority enforcing this Code judges the apparatus and wiring to be subject to the conditions indicated by the following classifications. If the apparatus and wiring are installed in rooms or sections of the building in which the particular hazardous conditions do not prevail, such wiring and apparatus may be of the type approved for such locations.

We find further, in the fine print notes following the rules defining the



various classes, the words: "This class may include such locations as some parts of, etc."

As has been previously pointed out, it would be quite impracticable to attempt to define in the Code the location and extent of hazardous area in every type of hazardous industry. As a matter of fact, conditions vary considerably even in establishments of the same kind, depending to a large extent on arrangement, type of materials used, and other factors. However, in the discussion which will appear in succeeding chapters, an attempt will be made to give some information concerning the treatment of representative establishments of the types most commonly encountered.

### Study Industries

The inspector or contractor should use every opportunity to familiarize himself with the more important details of the various hazardous industries he encounters. Such a study may include:

1. A thorough study of the processes involved, including an investigation of the liquids, gases, or solid substances which are to be used, scrutinizing these materials from the standpoints of ease of ignition, volatility, explosiveness, and general hazard rating.

2. A careful checking of the machines or devices which are to be used to determine whether or not the hazardous material will be confined within tanks, drums, or piping, and whether or not there will be a possibility of leakage into the open room, either during normal operation or through accidents.

3. An inspection of the layout of buildings, either from building plans or by actual visual inspection, to determine whether one small section of the plant should be thrown into the hazardous classification or whether or not the hazardous condition extends to all parts.

4. Consulting and cooperating with other inspection authorities, particularly Underwriters' special hazards inspectors and engineers who are familiar with conditions in establishments of a nature similar to those under consideration.

5. Frequent reinspections of plants involving hazardous processes or conditions to determine what conditions prevail during actual operation.

6. A study of statistics and reports on fires and accidents suffered in properties where hazardous processes are involved.

Matters such as ventilation, confinement of hazardous materials, fire cut-offs, and housekeeping may have important bearings on the classification and the extent of the hazardous area. Brief mention of these factors at this point may be valuable.

Theoretically, it is possible to provide ventilating systems which would reduce the amount of flammable gas, vapor, or dust in a room or building to the point where the resulting mixture would be below the lower explosive limit. However, under practical conditions, it is unwise to place complete confidence in any ventilating system, artificial or natural, for weather conditions, direction and velocity of wind, possible failure of the ventilating system, and other factors may result in effects more favorable to an explosion than those existing without ventilation. Therefore, in practically all attempts to determine the extent of a hazardous area, one is forced to eliminate entirely from consideration the possible value of ventilating space.

In many processes hazardous materials are confined within closed tanks, piping, or other enclosures, and in the interest of economy every effort is made to maintain the system free from leaks. Yet, in spite of the best of maintenance, leaks develop, containers are ruptured, or piping bursts because of mechanical disturbances which permit the issue of hazardous gases or vapors. Close

study must be given individual cases to determine whether or not special dispensation should be given processes where the hazardous materials are handled in closed continuous systems. In most instances the worst conditions should be assumed in the interest of safety.

In the older type of manufacturing plants it is common to find all processes conducted under one roof with no attempt at segregating especially hazardous processes from the non-hazardous by fire walls. In the more modern establishment, however, we usually find these hazardous processes conducted in a separate building or in a section of the main building cut off from the remainder of that building by standard fire walls. Such cut-offs should be given due consideration in determining the extent of the hazardous area. To illustrate, let us assume a metal working establishment where the finished articles are painted by the spray process, using a pyroxylin lacquer, which process is conducted in a fire-resistive addition to the main plant, cut off by a standard fire wall. Here, of course, assuming no other hazardous process in the main building, the hazardous area is represented only by the spray painting department.

The grade of housekeeping maintained, while of small effect from our standpoint in establishments where flammable vapors or gases may be present, is important where the other types of hazardous materials are concerned. However, the inspector has no assurance that favorable conditions of housekeeping and general care will prevail continuously. A change in management or personnel might cause conditions to decline to such a degree that the most rigid standard of electrical construction would not be sufficient. Faced with such considerations, one must, to a large degree, disregard housekeeping and general care in determining whether or not certain premises should be classed as hazardous.



## Typical Cases of Hazardous Location Fires and Explosions From Electrical Causes

*Automobile Body Plant, Detroit, Mich., April 23, 1927.* The fire or explosion originated on the third floor of a five story building where lacquer spraying was done. It was due to the ignition of pyroxylin dust or residue by a spark from, or the overheating of, a mercury vapor lamp over a spray booth. The first explosion was enough to shake the pyroxylin dust into suspension in the air and this, together with the gases formed by the decomposition of residue, resulted in a second explosion of great violence. Several workmen were killed outright by the blasts and others died later of their burns. In all, twenty-three lives were lost. Loss, \$2,000,000.

*Furniture Factory, North Bennington, Vt., January 5, 1924.* A spark from a motor in a spray booth ignited varnish spray inside of the booth. Loss, \$4,500.

*Furniture Factory, Boston, Mass., August 18, 1926.* An electric light bulb in a spray booth was accidentally broken, igniting the flammable vapors. Loss, \$197,000.

*Clothing Factory, Toronto, Ont., March 13, 1927.* An unprotected electric light had been permitted to lay lighted in a tray of celluloid buttons. The celluloid started to decompose and presently the vapors were ignited. The fumes prevented firemen from entering which greatly increased the extent of the loss. Loss, \$10,000 to \$20,000.

*Dry Cleaning Plant, Harvey, N. D., March 19, 1928.* A spark from an electric switch ignited gasoline vapor and caused an explosion in a small detached cleaning room. Loss, \$850.

*Chemical Plant, Belleville, N. J., September 6, 1930.* Fire was caused by the ignition of gasoline fumes by an electric motor used in pumping a solution of phosphorous oxy-chloride phenol and gasoline from the mixing tank to the crystallizing vat. Fire occurred when an employee started the electric motor which caused the ignition of the gasoline fumes. The fire was held in check by sprinklers. Loss, \$2,700.

*Paint and Varnish Works, Reading, Pa., August 28, 1928.* Fire occurred in a paint mixing room where tanks were located. There were eleven 225-gallon tanks located on a turntable on which was also located an electric light on a drop cord which was used occasionally to examine the tanks. This light was apparently unguarded and it is thought that it broke directly over a tank and ignited vapors. An employee who was present did not see the bulb break, but heard glass falling and saw flames shoot from the tank immediately afterward. Loss, \$110,000.

*Bulk Gasoline Station, Minot, N. D., July 3, 1928.* Two persons lost their lives and two others were badly burned in a fire following an explosion in the basement of the warehouse of an oil company. A spark from an electric motor used to operate the pump which pumped gasoline and other petroleum from the tank cars to storage tanks ignited an accumulation of flammable vapors. Loss, \$23,820.

*Grain Elevator, Java, S. D., April 13, 1931.* A single phase motor was being started by means of an open resistance starter. At the same instant a dust explosion occurred, damaging the building considerably and seriously burning three men. Loss, \$2,000.

*Grain Elevator, Huntington, Ind., October 18, 1926.* An open squirrel cage motor located in the cupola had burned out during the afternoon. The motor had been removed for rewinding, at which time there was no evidence of fire. However, late that night fire broke out in the cupola, probably from a spark smoldering in accumulated dust, and total destruction resulted. Loss, \$21,985.

*Feed Mill, South Bartonville, Ill., January 1, 1919.* An electric spark is given as the cause of an explosion and fire in the grinding and mixing plant. Loss, \$750,000.

*Mattress Factory, Derry, N. H., May 22, 1929.* The fire was caused by ignition of

loose flammable stock by an arc from an electric motor driving a sewing machine located between two mattress forming machines. Fire flashed rapidly over every floor causing the death of an elderly woman. Loss, \$30,000.

*Hosiery Mill, Macon, Ga., December 17, 1926.* Sparks from a switch controlling the card room motor ignited accumulated cotton lint clinging to the wall. The fire flashed up through an old elevator tower and into the attic. Automatic sprinklers held the fire in check but, when the fire department responded, considerable water was thrown into the building causing heavy water damage. Loss, \$2,000 to \$4,000.

*Terminal Cotton Warehouse, New Orleans, La., June 5, 1919.* This fire was caused by the breaking of one of the cast iron collector shoes on an electric crane and short circuiting the collector rail. A slight arc resulted and molten metal fell on a quantity of baled cotton 10 feet below, igniting some loose lint. The fire was discovered promptly and the damage confined to five bales of cotton. Two fires of a similar type occurred in this same warehouse on March 10 and 16, 1916. The first resulted in a loss of about \$1,000 and the second about \$2,500.

*Paper Mill, North Chattanooga, Tenn., February 29, 1928.* Sparks from a short circuit in a two-piece plug connector in a portable cord connected to a portable electric elevator in a paper warehouse ignited loose paper. A fireman was suffocated in fighting the fire. Loss, \$43,344.

*Flour Mill, Omaha, Neb., December 18, 1931.* One man was killed, several others injured, and the building destroyed when an unprotected portable lamp was broken as it was being lowered into a flour bin. The sparks from the broken lamp ignited the suspended dust causing a terrific explosion.



## CHAPTER II

### Class I Hazardous Locations

IN THE preceding chapter a general discussion was given on the division into four classes of Article 500 of the National Electrical Code. It will be remembered that in Class I were placed those locations where flammable volatile liquids, highly flammable gases, mixtures, or other highly flammable substances are manufactured, used, handled, or stored in other than their original containers. In order that the engineer or inspector be better qualified to determine where and to what degree the hazards represented by these materials are present, some knowledge of the various substances and their characteristics will prove useful.

**Flammable Volatile Liquids.** Liquids of this class are many and find wide use in a variety of processes and industries. In this class come gasoline, lacquer solvents, cleaning fluids, and many others familiar to the inspector. Some of these liquids assume the vapor state very readily and at relatively low temperatures. For any liquid there is a temperature below which it will not assume the vapor state in dangerous quantity and this temperature is known as the flash point of the particular liquid concerned. As an example, gasoline (74-76 A.P.I.) has a flash point of  $-45^{\circ}$  F., which means that at temperatures as low as  $45^{\circ}$  below zero flammable vapors will be given off in dangerous quantities. The

tendency to evaporate becomes greater with increases in temperature; hence, a liquid with a relatively high flash point may, under some conditions, such as when the processes require heat, become quite hazardous. As a borderline example, consider kerosene, which is assumed to have a flash point of  $100^{\circ}$  F. Under normal conditions of temperature, kerosene would not be greatly hazardous, but in locations or processes where the temperature exceeds  $100^{\circ}$  F. this liquid becomes really hazardous.

In the cases of most flammable volatile liquids there is a minimum as well as a maximum concentration of vapor in air below and above which propagation of flame does not occur on contact with a source of ignition. These concentrations are known as the lower and upper explosive or flammable limits and are usually represented in terms of percentage of vapors in air by volume. Between the lower and upper limits there is a certain concentration that will produce the most intense combustion or explosion of which the vapor is capable. It is this concentration that we attempt to obtain, for instance, when we adjust the carburetors of our automobiles. The difference between the lower and upper limits is known as the flammable or explosive range. As an example, gasoline has a lower explosive limit of 1.4% and an upper

limit of 6% giving a range of 4.6%.

The behavior of a vapor when released is determined by its vapor density, which is nothing more than the comparison in weight of a given volume of vapor with that of the same volume of air under similar conditions. Thus, gasoline has a vapor density of 3.5, that is, it is three and one-half times as heavy as air and therefore has a tendency to seek the lower levels in a room unless distributed by air currents or other agencies.

Various vapor and air mixtures require igniting agencies of certain temperatures to produce combustion which will propagate itself. The lowest temperature at which this occurs is known as the apparent ignition temperature. For gasoline vapor and air this temperature is  $536^{\circ}$  F.

From the standpoint of the inspector, factors such as explosive limits and vapor densities need not be given consideration in judging a hazardous location, as he has no assurance that the vapor and air mixtures will be above or below the flammable limits; nor does he know positively that because a vapor is heavier than air that it will under all conditions remain in the lower level of a room. While consideration of ignition temperature is important in the case of motor frames, apparatus enclosures, and heaters, it should be kept in mind that we are dealing with an igniting agency having a temperature of from



6000 to 7000° F., that is, an electric arc. However, the flashpoint of a flammable volatile liquid is important in determining whether or not a certain premise should be judged as being hazardous. Under ordinary conditions, liquids having a flashpoint of over 100° F. should be judged as relatively non-hazardous in most areas unless heated.

Following is a list of the more prominent flammable volatile liquids and their approximate flash points:

Liquid	Flashpoint (Closed Cup) Deg. F.
Carbon Disulphide	-22
Ethyl Ether	-49
Gasoline	-45
Benzol	-4
Acetone	3
Toluol	16
Methyl Alcohol (C. P.)	52
Denatured Alcohol (Form No. 5)	61
Ethyl Alcohol (Abs.)	54
Ethyl Acetate (C. P.)	28
Turpentine	91
Kerosene	100
Amyl Acetate (Pure)	77
Amyl Alcohol (Fusel Oil)	100
Butyl Iso Alcohol	88
Petroleum Ether	-69

The so-called naphtha and benzene, two commonly used liquids, are really forms of gasoline of lower boiling point and should be regarded as being in approximately the same class as gasoline.

**Flammable Gases.** In this class we find a variety of gases used for various purposes. Flammable gases form explosive or flammable mixtures with air in the same manner as do the vapors of flammable liquids, which we have previously discussed. The hazards of the two classes of matter are therefore quite similar from our viewpoint. It is, of course, not the intent to regard as hazardous locations all premises where flammable gases are used, as this would affect even ordinary dwellings. We are more interested in establishments where the gases are produced or are used as components of other manufactured products. Many of the flammable gases have wide explosive ranges and many of them have densities closely approximating that of air,

thus making them difficult to control.

Following is a list of prominent gases encountered in industry:

Illuminating Gas  
Hydrogen  
Acetylene  
Ethylene  
Ethane  
Propane  
Carbon Monoxide  
Butane  
Methane  
Propylene

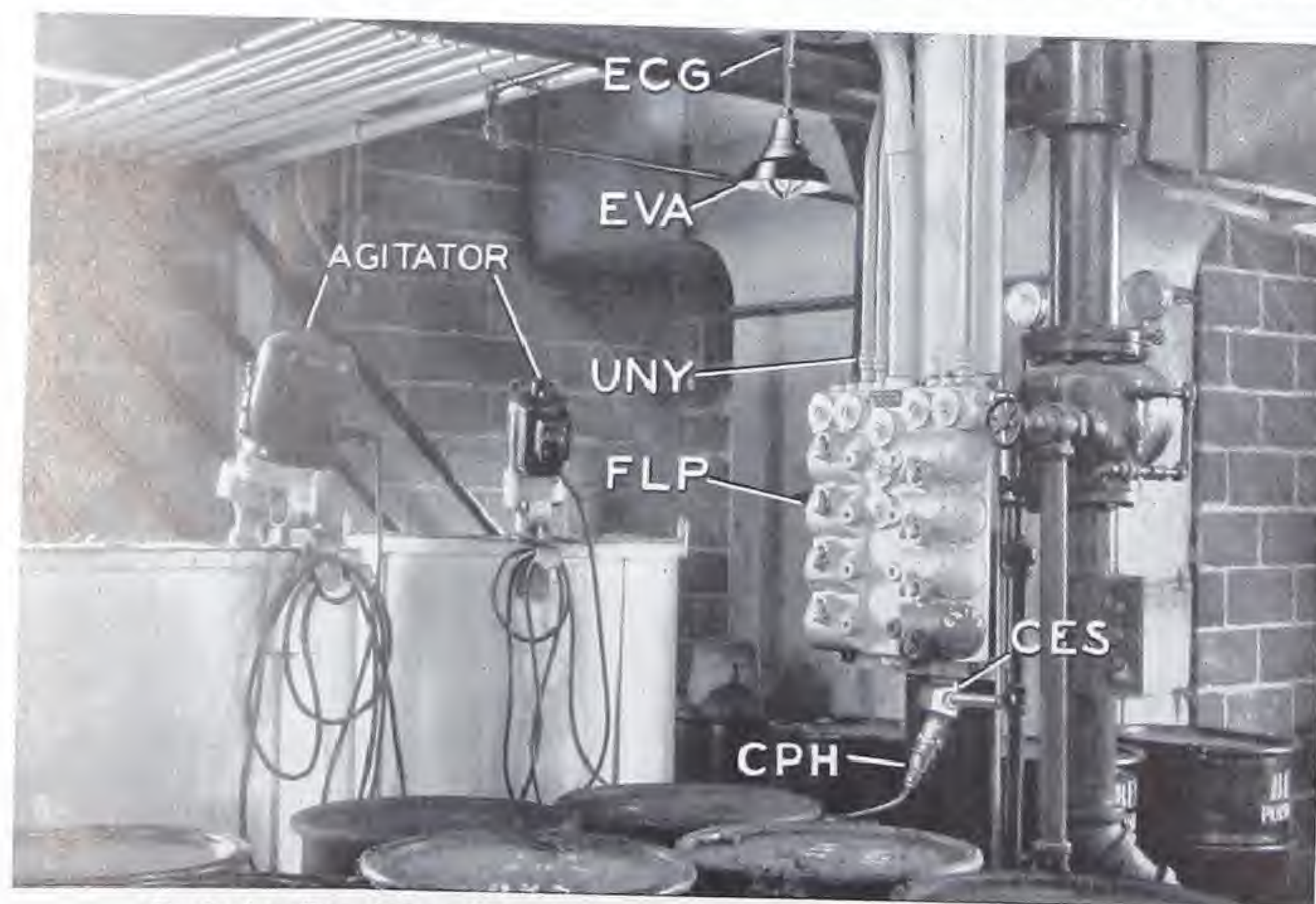
**Highly Flammable Solids.** In this class we may place many commercial solid substances which may better be called explosives. Gunpowder, dry picric acid, nitrocellulose, naphthalene, and pyroxylin plastic are prominent examples of highly flammable solids which may be encountered.

In the more usual manufacturing operations, pyroxylin plastic, better known as "celluloid," probably represents the most hazardous material found. It is a material which is used to a great extent for the manufacture of many types of goods, including toilet articles, photographic film, artificial leather, billiard balls, piano keys, advertising novelties, and a host of others. Its manufacture and use involve severe hazards for its ignition point is very low, probably

in the neighborhood of 300° F. and therefore it may be ignited by a slight electric arc or spark, or even by the heat of an incandescent lamp. It burns very rapidly and combustion is attended by the evolution of explosive and poisonous fumes or vapors. In some industries, scrap pyroxylin plastic, such as film cuttings and punchings, is purchased to be used for the preparation of other commodities.

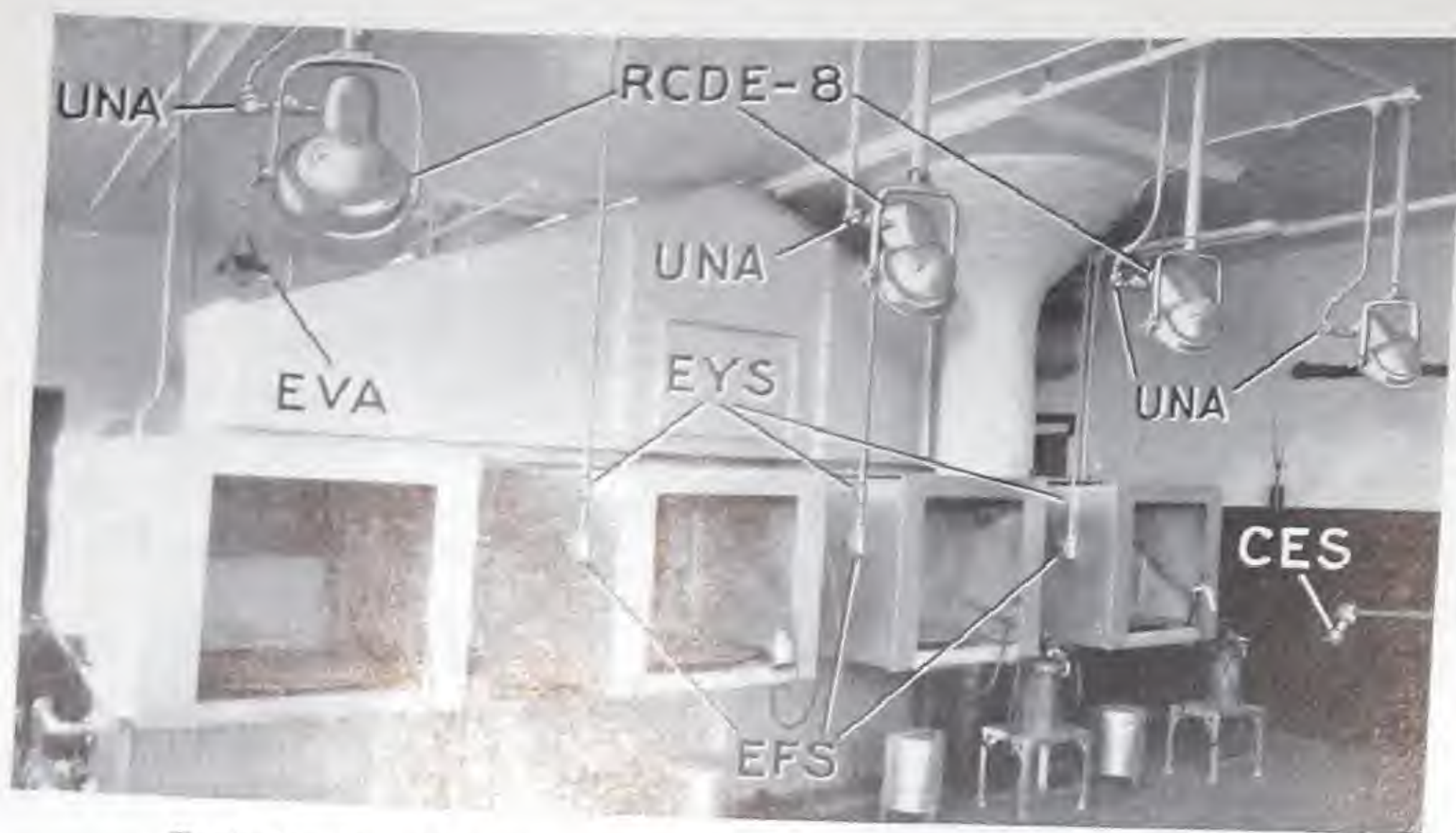
**Highly Flammable Mixtures.** Many substances, in themselves non-hazardous, are formed into hazardous products when solvents of low flash point are used to place them in solution or to form a paste. When the process involves the solution of a hazardous material in an equally hazardous solvent, the resultant hazard is usually greatly multiplied.

As a representative mixture of the class first mentioned, we have rubber cement, which is usually a solution of rubber in gasoline or naphtha. This type of cement is used in many processes in the rubber industry, often in such a manner that the rooms in which operations take place have a very appreciable amount of gasoline or naphtha vapor present,

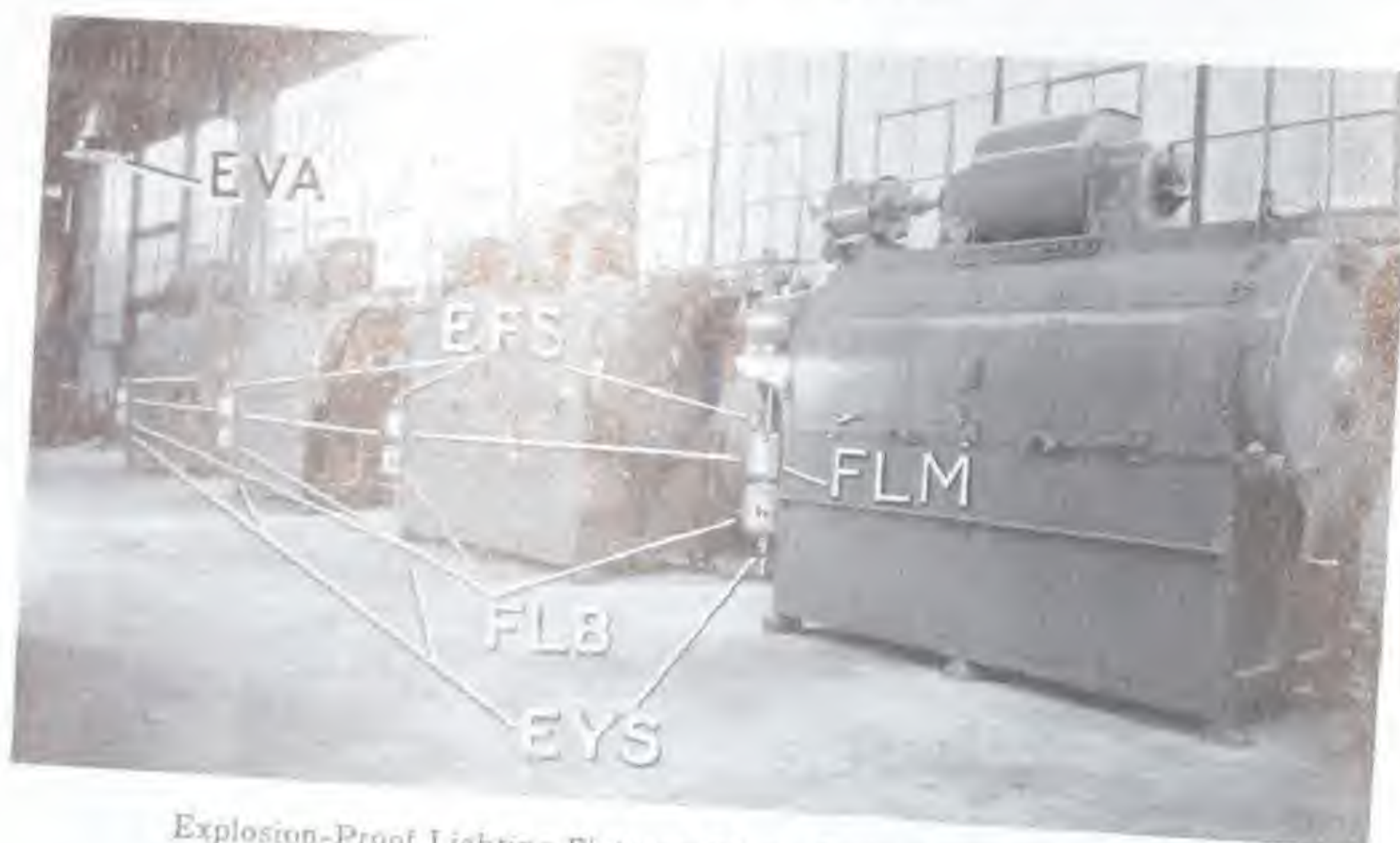


Explosion-Proof Panelboard, Lighting Fixture, and Plug Receptacle in Rubber Cement Department

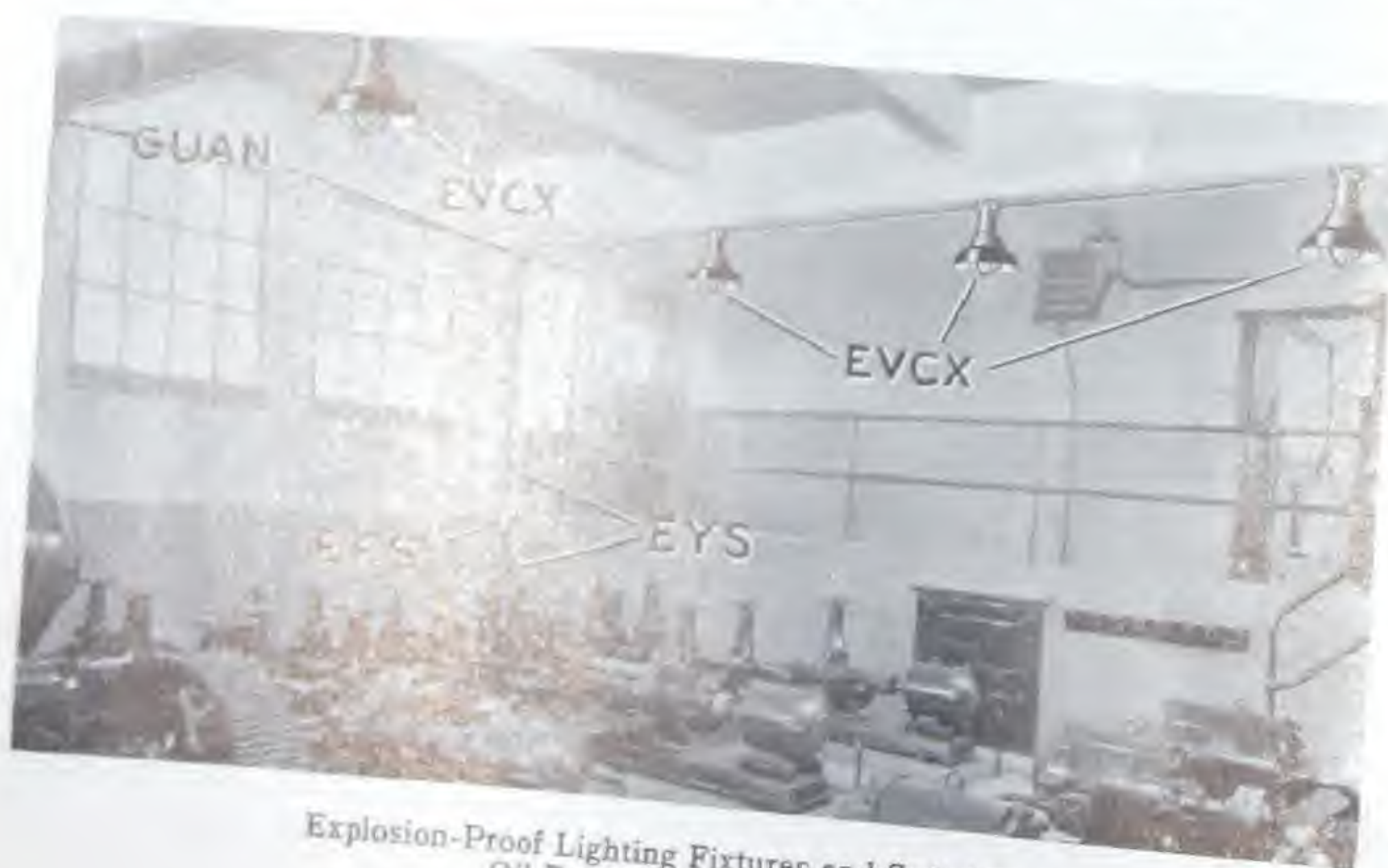




Explosion-Proof Lighting Fixtures, Switches, and Plug Receptacle in Spray Booth Painting Room



Explosion-Proof Lighting Fixtures, Motor Starters, and Switches in Dry Cleaning Plant



Explosion-Proof Lighting Fixtures and Switches in Oil Refinery Pump House

necessitating adequate artificial ventilation and rigid precautions to remove sources of ignition. Of the second class a good example is afforded by pyroxylin lacquers which consist of pyroxylin or nitrated cotton, in itself hazardous, blended with the desired oil and pigments and mixed with flammable volatile solvents and thinners such as amyl acetate, acetone, or butyl alcohol.

Many of the modern paint and varnish mixtures employ flammable volatile vehicles to promote quick drying. There are also many commercial mixtures on the market, such as varnish removers, cleaning compounds, and others which entail hazardous conditions in their preparation if not in their use.

In the dry cleaning industry it will sometimes be found that the fluid or solvent used is referred to as a "safety solvent." Such solvents are usually "straight" carbon tetrachloride, a non-hazardous liquid, or a mixture of a flammable volatile such as naphtha or benzine and carbon tetrachloride, the latter being added to produce a fluid of higher flash point than naphtha or benzine alone.

### Typical Class I Locations

It is impracticable to attempt to detail in the space available a complete list of types of establishments in which Class I conditions prevail and to name exactly the extent of the hazardous area in each. Each establishment must be judged on its own merits by the inspection authority, as arrangement of buildings and equipment may greatly affect individual cases. However, the following brief and general discussion may be of assistance to the inspector in this regard. We shall name various types of normally hazardous establishments and suggest the extent of the hazardous area.

**Dry Cleaning Plants.** In dry cleaning establishments using any but non-flammable or "safety" solvents, the hazardous areas consist of



the washing, drying, and solvent recovery rooms or buildings. The "spotting" department is usually not judged to be a hazardous location if the usual requirements regarding the amount of flammable solvents exposed are complied with. Before permitting the installation of ordinary electrical equipment and wiring in a dry cleaning plant in which it is intended that none but non-flammable or "safety" solvents are to be used, reasonable guarantees should be had by the authority enforcing the Code that this will be the case.

**Petroleum Refineries.** Practically all buildings are to be considered as hazardous areas, except offices, shops, laboratories, warehouses used solely for storage of lubricating oils and greases, and boiler houses. Special consideration is given to electrical equipment about open stills, loading racks, and open wash and bleach towers, and also to the type of portable lights used in or about tanks.

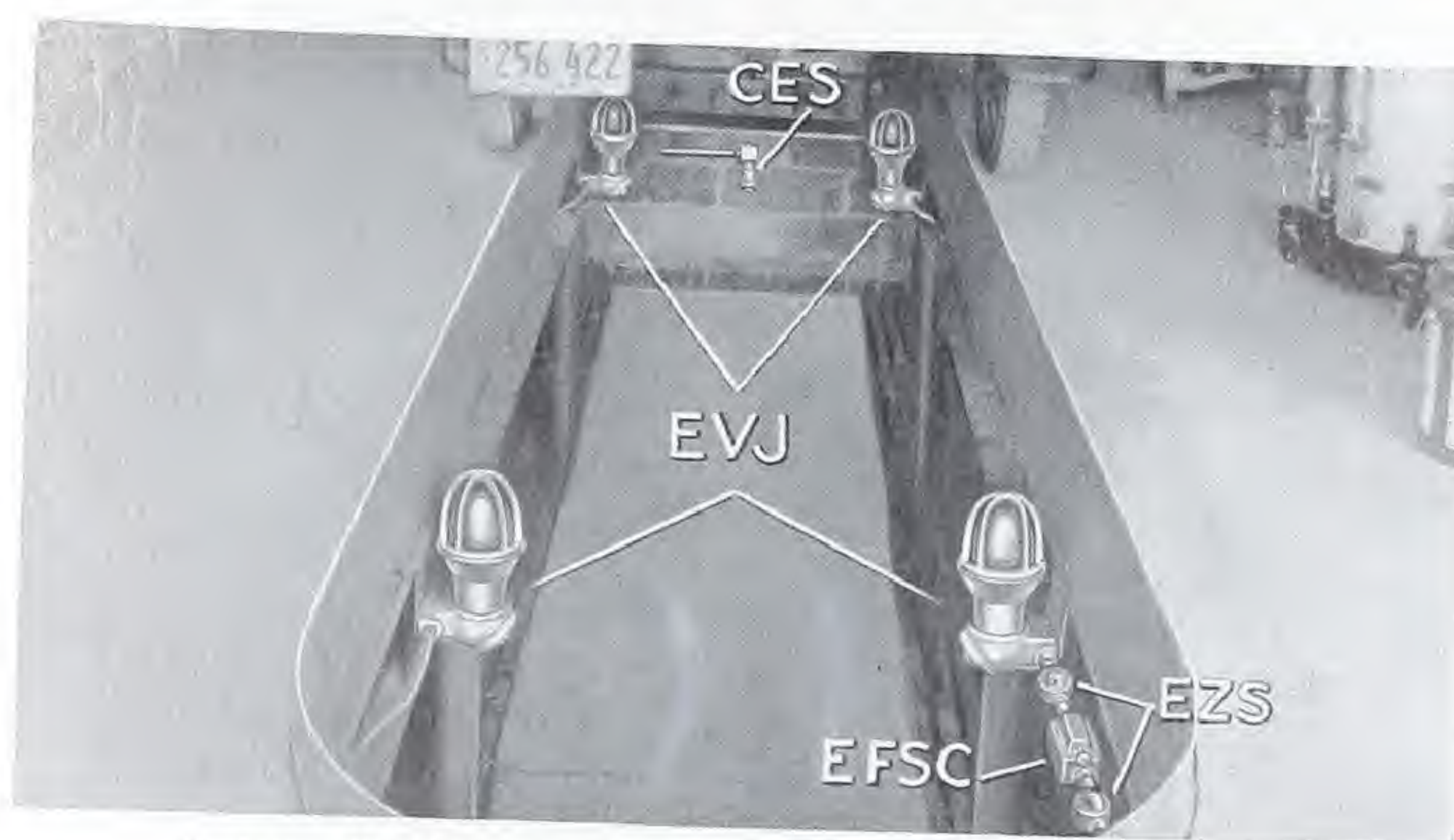
**Bulk Oil Stations.** The hazardous areas are confined to the interiors of pump houses, although consideration should be given to the type of portable lights used at tank cars and at loading or unloading racks.

**Filling Stations.** The enclosures of the discharge devices or pump assemblies and similar devices are the hazardous areas, but they do not include station shelters and canopies. Greasing and oil changing pits, if present, should be regarded as hazardous areas due to the likelihood of the presence of gasoline vapors.

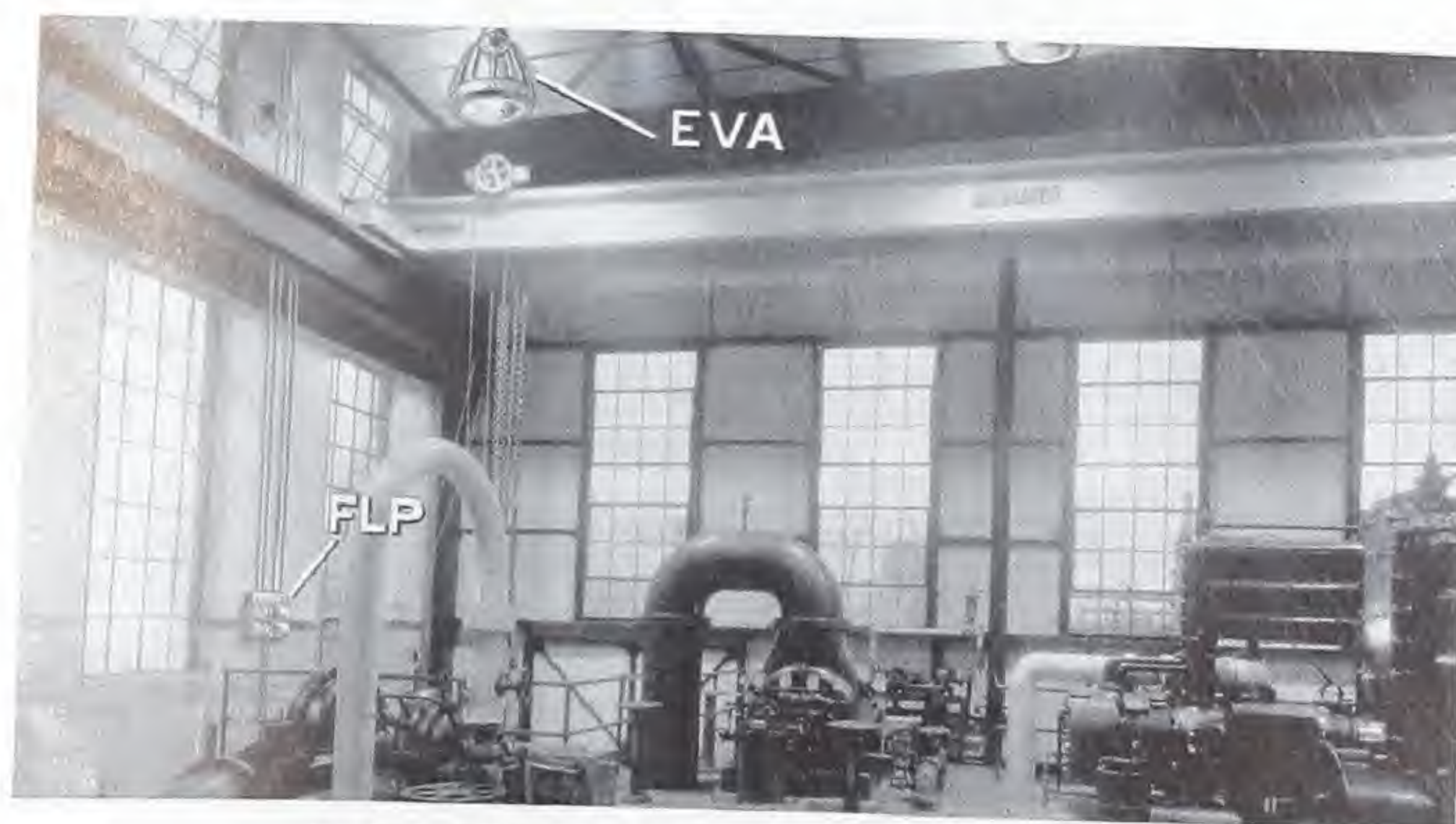
**Gas Plants.** The possibility of leakage of gas is continually present in the process of manufacturing gas, especially in the condenser building and in the rooms containing the purifiers and scrubbers, meters, governors, and control valves. These should be regarded as Class I locations. In the retort or generator building, the retorts are heated by open fires so there seems to be no good sense in asking that Class I rules



Floodlighting of Gasoline and Bulk Oil Station



Explosion-Proof Lighting Fixtures, Switches, and Plug Receptacle in Grease Pit of Automobile Service Station



Explosion-Proof Lighting Fixtures and Panelboard in Pumping Room of Gas Plant





Explosion-Proof Lighting Fixtures in Spray Booth Room and Drying Area

be followed for electrical equipment installed therein, although some parts may warrant being judged Class II locations because of the presence of coal dust. In the case of natural gas, or in sewage disposal plants where the gases are recovered for use, the pump or compressor houses, and the meter, governor, and valve rooms should be regarded as Class I locations.

**Spray Painting Establishments.** These are associated with a number of industries including those producing automobiles, furniture, metal products, and many others including even hats. In the case of the smaller manufactured articles, the process is usually carried out in a separate room cut off from the main plant by fire walls, in which event only that room need be considered a Class I location. When large articles, such as automobiles or railroad coaches, are spray finished this is not always practicable. In such cases the hazardous area is dependent on the arrangement of spray booths, if any, the nature of the ventilating system, and the degree of cleanliness. In general, the extent of the hazardous area in this case may be assumed to extend to a distance of 10 to 25 feet from the booth. The rooms in which the lacquers are mixed and stored should also be regarded as Class I locations. The hazard of spray

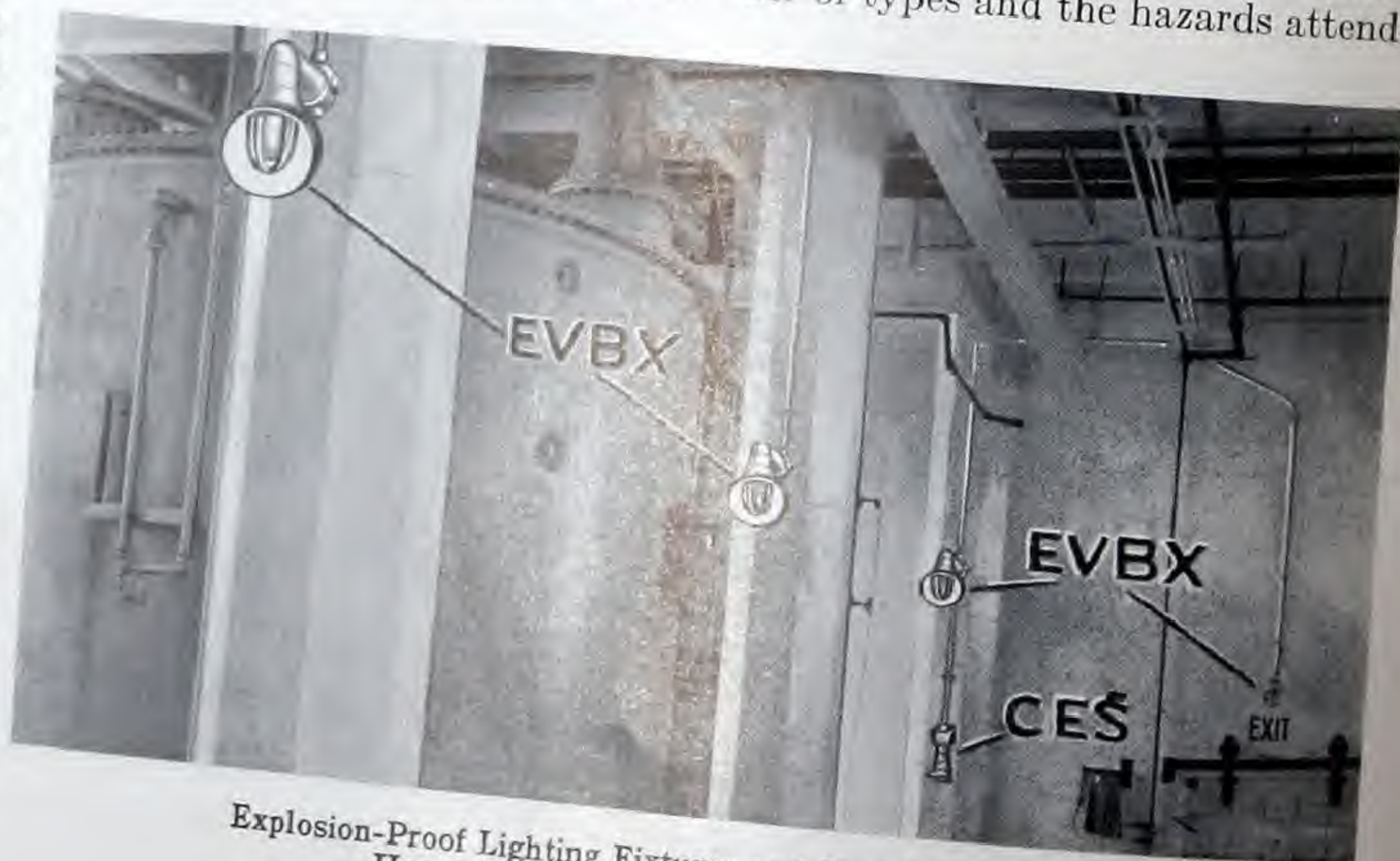
painting varies with the type of lacquer or varnish used, the pyroxylin lacquer being the most hazardous due to the presence of a highly flammable residue as well as the vapors of a flammable liquid vehicle or thinner.

**Dip Tank Painting Processes.** These are used in many industries including automobile, furniture, electrical machinery, millinery, and others, and are usually conducted in a cut-off room in which is also a drying oven or tunnel. The room, especially the area immediately around and over the dip tank, and the interior of the oven or tunnel, should be regarded as a Class I location. As before, the hazard varies

with the type of finishing material used and with the arrangement of the equipment, nature of ventilation, and degree of cleanliness.

**Chemical Works.** Owing to the extremely large variety of chemicals being manufactured and the many and varied processes employed, it is impracticable to include here anything more than mere suggestions. Each chemical plant should be studied individually, paying particular attention to the nature of raw materials, processes, and materials produced. Wood distillation and coal tar plants, establishments producing the various alcohols, and those manufacturing various chemical solvents such as ethyl acetate, ether, and others, should be scrutinized carefully. Many smaller establishments producing miscellaneous industrial chemical preparations such as shoe dressings, varnish removers, cleaning fluids, insecticides, and others make use of flammable solvents. The same is true of factories producing pharmaceutical chemicals, fruit essences, and perfumes. The extent of the hazardous area in each may be determined only by thorough study and the use of good judgment.

**Paint and Varnish Factories.** Paints and varnishes are of a number of types and the hazards attend-



Explosion-Proof Lighting Fixtures and Plug Receptacle in Hazardous Room of a Chemical Plant



ing their preparation are dependent on the type of thinner and solvent used. The thinner may be no more hazardous than turpentine, but often naphtha, benzine, alcohol, or acetone are used, thereby greatly increasing the hazard. In ordinary paints and in rosin or shellac varnishes the hazard, from our viewpoint, is represented by the presence of the vapor of these volatile flammable thinners in the room where the thinners are added, where the finished product is placed in containers, and in the rooms or compartments containing pumps used to convey the thinner from storage tanks to mixing tanks. Pyroxylin varnishes, or lacquers as they are more frequently called, are made by dissolving pyroxylin in a solvent such as amyl acetate. To this solution a thinner, such as benzol or alcohol, is added to permit ready flow. The process of manufacture is hazardous throughout because all of the materials used are hazardous in themselves as is the finished product. Usually more stringent requirements than those imposed by Class I rules are observed in establishments manufacturing such lacquers.

**Artificial Silk Factories.** Several different processes are used for the manufacture of artificial silk, but all of them in general use involve haz-

ards which warrant classing certain sections or buildings as Class I locations. In one well known process, the "viscose" process, wood pulp is treated in churns with carbon disulphide forming cellulose xanthate. As carbon disulphide is one of our most hazardous flammable volatiles, this part of the process is usually carried out in a separate building. The buildings containing this churn process, as well as any containing pumps or other equipment for handling the carbon disulphide, are subject to the strict application of the rules for Class I locations. Acetate silk is produced by a process, one part of which involves the solution of cellulose acetate in acetone, a

flammable volatile liquid. After filtering, it is ready to be formed into filaments. In this process the rooms or sections from the point where the acetone is introduced to the points where the filaments are formed, and including the pump houses containing the acetone handling pumps, should be regarded as Class I locations.

**Pyroxylin Plastic Factories.** The manufacture of pyroxylin plastic, or "celluloid" as it is commonly known, is usually in the hands of large firms who are fully aware of the severe hazards entailed. Some parts of the process are so hazardous that rules more rigid than those prescribed by Article 500 are observed, in some cases even to the entire exclusion of all electrical apparatus and wiring from certain rooms and sections. The inspector will find, however, a wide variety of establishments manufacturing articles from pyroxylin plastic. The processes involve the handling and use of sheet or formed pyroxylin plastic and usually equipment for the utilization of scrap pyroxylin plastic is provided. The storage of the pyroxylin plastic in large quantities, together with the forming of articles and the storage of the finished product, renders the hazards of such factories of a serious nature. Coupled with this are the hazards connected

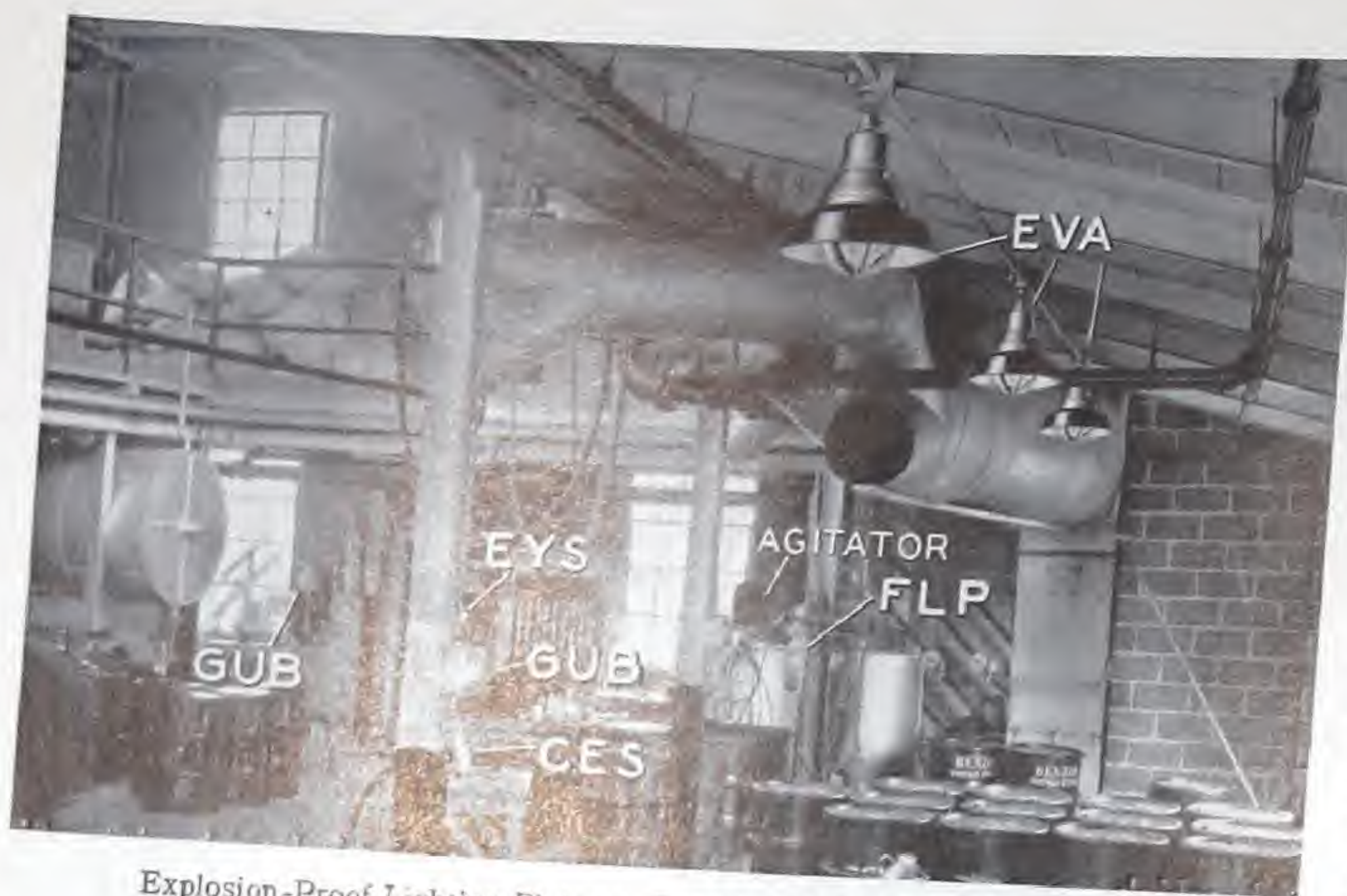


Explosion-Proof Lighting Fixtures, Switches, and Motor Starters in Storage Room of Paint Manufacturing Plant



Explosion-Proof Lighting Fixtures, Motor Starters, and Plug Receptacle in Churn Room of Rayon Plant





Explosion-Proof Lighting Fixtures, Panelboard, and Plug Receptacle in Rubber Cement Department of Shoe Factory

with the storage, handling, and use of solvents, and the reworking and storage of pyroxylin plastic scrap. The rules for Class I locations apply in full to factories of this type, except in those sections where the pyroxylin plastic or the articles made from it are not stored or used. This would exempt offices, power houses, locker rooms, and similar locations. In factories where only a small part of the space is utilized by processes involving pyroxylin plastics, the hazardous area is generally taken to ex-

tend to a distance of from 10 to 20 feet from the particular process.

**Fabric and Paper Coating Plants.** In factories of this type are produced linoleum, oil cloth, artificial leather, and similar materials. In some of these, notably those producing artificial leather, in reality a pyroxylin coated fabric, the processes are hazardous throughout and practically all parts of such plants, including the sections used for the storage and mixing of pyroxylin and solvents, the spreader room, and the drying



Explosion-Proof Switches and Plug Receptacle in Hospital Operating Room

room, should be considered as in Class I.

**Rubber Industry.** The chief hazard associated with the rubber industry is the churn process in which rubber is dissolved in a flammable solvent, usually gasoline, benzine, or naphtha. Therefore, churn rooms as well as pump rooms and the rooms containing the solvent recovery process are to be considered as Class I locations. In the preparation of rubber coated fabrics the cloth is coated with rubber which is dissolved in gasoline or other flammable solvent and applied by means of a spreader machine through which the cloth is fed. The cloth then passes over a drying table and is hung in festoons in a dry room for vulcanizing and curing. The churn room, the spreader and dryer rooms, and any room used to contain pumps for the handling of flammable solvents are to be considered as Class I locations. Rubber gloves, rubber dolls, and such articles are usually made by dipping forms of the desired shapes into a solution of rubber and a solvent, usually gasoline. The solution is contained in open dip tanks and hence results in the liberation of quantities of flammable vapors. The rooms in which this process is conducted, as well as those in which the solution is prepared, are to be regarded as Class I locations. The manufacture of automobile tires entails the use of large quantities of rubber cement but, if reasonable care is taken, it is not necessary to designate the rooms where this cement is applied as Class I locations. However, the churn rooms where the cement is prepared are definitely Class I locations.

**Leather and Shoe Industry.** The hazards of this industry, from our viewpoint, are those associated with the use of pyroxylin lacquers for the production of lacquered leather, of the use of flammable varnishes for making patent leathers, the use of pyroxylin plastic for covering heels



or forming box toes, and the use of pyroxylin lacquer for coating heels. These hazards are similar to some of those previously described under the respective subjects and the inspector should be governed by the comments applying.

**Hospitals.** The operating rooms, due to the presence of flammable anaesthetics and the X-Ray film storage vaults, are to be considered as Class I locations. When only acetate film is stored, the film storage vault need not be considered as a Class I location, but usually some nitrate film is stored.

**Liquor Distilleries.** In liquor distilleries both Class I and Class II hazardous conditions are found. The grain receiving and milling departments are to be classed as Class II locations and treated in a manner similar to that later described for Grain Elevators and Feed Mills. The still house, the cistern room, and their additions not adequately cut off so as to be reasonably free from alcohol vapors should be considered Class I locations. The bottling department for a reasonable distance from the area where the bottles are filled and capped should also be regarded as a Class I location as should the room or section where the casks of aged liquor are emptied into tanks or vats for blending previous to bottling. The rack houses or warehouses in which liquor is stored in casks for blending may under some circumstances be judged Class I locations.

**Soap Factories.** In some types of soap naphtha is added and therefore the manufacture of such soaps entails the storage and pumping of naphtha. This requires the application of the Class I rules to naphtha pump houses or rooms as well as to the rooms where the naphtha is added to the soap. In toilet soap of the transparent variety, alcohol is used for the purpose of dissolving the

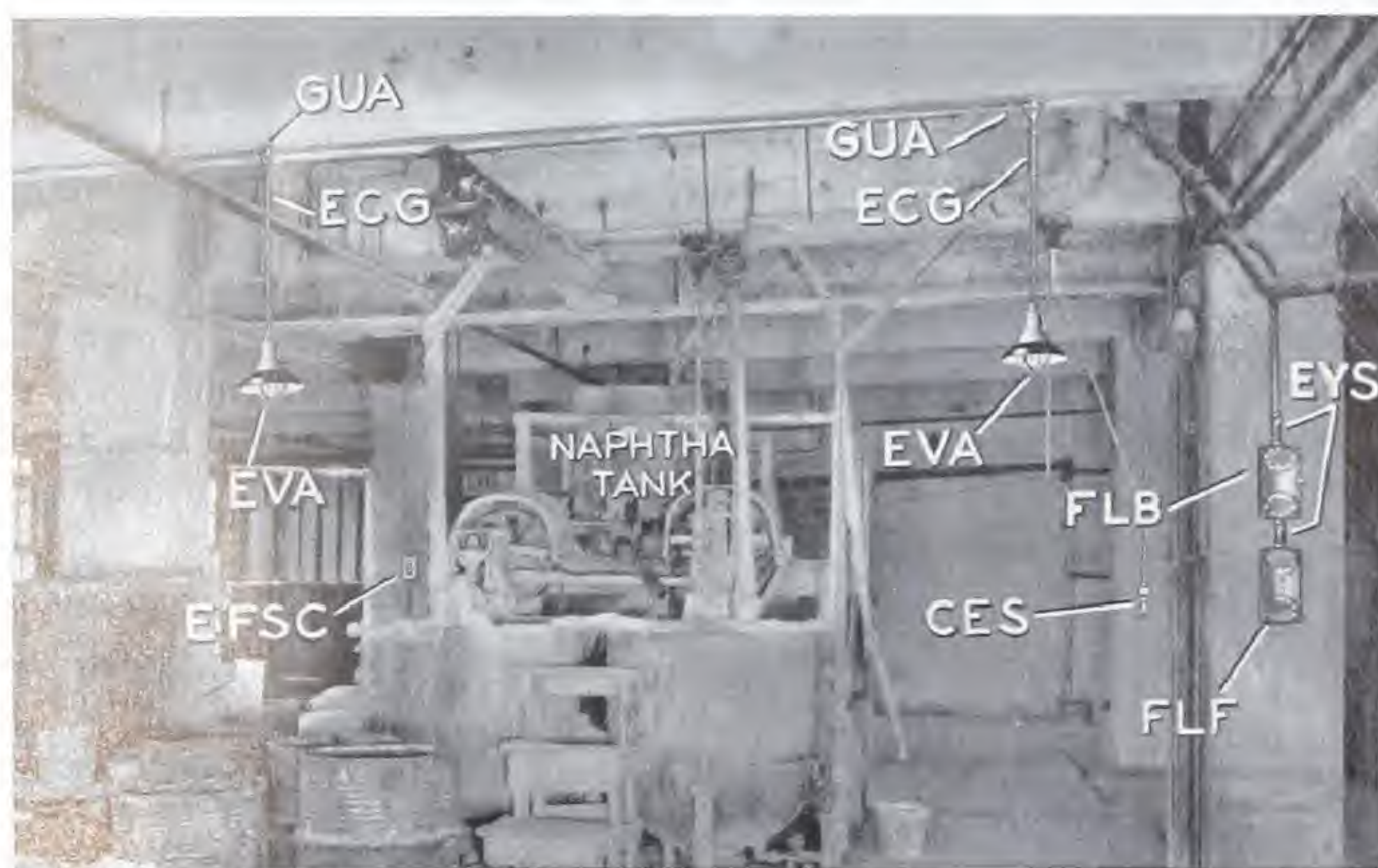


Explosion-Proof Panelboard and Lighting Fixture in Bottling Room of Distillery

soap and permitting the impurities to settle, whereupon the alcohol is distilled off. The rooms where these processes are carried on should be regarded as Class I locations. In the manufacture of liquid soap a hard soap is dissolved in warm alcohol. If operations are extensive, the flammable vapors of alcohol will be present, and therefore the rooms or sections involved should be regarded as Class I locations.

**Miscellaneous.** Various other industries or processes should be scru-

tinized for hazardous conditions. These may include rotogravure print shops which employ an ink usually consisting of one part of ink to three parts of naphtha; metal working plants which sometimes employ a flammable solvent for removing cutting oil and grease previous to heat treatment of metal parts; oil clothing factories where the garment is painted with a naphtha thinned varnish; and hat manufacturing establishments where hats are sprayed or dipped in pyroxylin lacquer.



Lighting Fixtures, Motor Starters, Switches, and other Explosion-Proof Condulets in Soap Manufacturing Plant



## CHAPTER III

### Wiring for Class I Locations

**E**ARLY in the development of apparatus for Class I locations it was found that it was practically impossible to construct apparatus which was vaportight, that is, so constructed that vapor would not enter the enclosing case. The alternate heating and cooling of the air within enclosures such as switch cases, conduit systems, motor cases, and the like results in an unbalancing of pressures to such an extent that the vapor or gas is forced through even the most minute openings. This phenomena is usually referred to as "breathing." Therefore, assuming that the vapor or gas will enter the conduit or other parts of the enclosing systems, it can be expected that the mixture of vapor or gas and air within will explode. With this in mind, it is apparent that conduit joints and fittings, motor and controller cases, and other enclosures must be so designed as to prevent the emission of flame or hot gases, as well as to withstand the pressures developed within the enclosing system in event of such explosion. Should flame or hot gases be permitted to issue from the enclosure, it is clear that any explosive mixture surrounding it would be ignited. The standard to which Class I apparatus is constructed is designed to avoid such ignition. Hence, in the various rules for Class I locations we find the terms "vaporproof" and "vaportight" which are defined in Article 100 (Definitions) as follows:

Explosion-proof means enclosed in a case which is capable of withstanding an explosion of a specified gas or vapor which may occur within it, and of preventing the ignition of the specified gas or vapor surrounding the enclosure by sparks, flashes or explosions of the gas or vapor within.

The term "vaporproof" which is often heard and used with reference to apparatus intended for Class I locations is somewhat meaningless in that connection and should not be used.

Underwriters' Laboratories, Inc. has written standards for the construction of the various types of electrical apparatus for Class I locations and has developed test procedures to determine the value of devices submitted for listing. In general, the standards prescribe; first, certain minimums of strength of the enclosing case and its fastenings to resist the explosion pressure; and second, that joints, operating shaft openings, and fastening openings be of such design as to prevent the emission of flame or hot gases. The first requirement is clearly met by providing a case or enclosure having sufficient strength of wall and fastenings, while the second can be accomplished by providing flanged covers of sufficient width, or sleeves of sufficient length, to cool the gases or extinguish the flames before they reach the exterior.

#### Four Groups

Due to the fact that the various gases and vapors have varying degrees of hazard with regard to ex-

plosion pressures and other factors, it was found by the Laboratories that it was desirable to divide Class I into four groups in accordance with their degree of hazard, as follows:

Group A—Atmospheres containing acetylene.

Group B—Atmospheres containing hydrogen.

Group C—Atmospheres containing ethyl ether vapor.

Group D—Atmospheres containing the vapors of gasoline, common petroleum, ethyl alcohol, methyl alcohol, acetone, and lacquer solvents.

In Underwriters' Laboratories, Inc. published Electrical List, the various devices are listed in accordance with the above. It should be pointed out that a motor, for instance, listed for a Group D atmosphere is not approved for a Group A, B, or C atmosphere; but a Group C motor, or one listed for Group A or B, may be used in a Group D atmosphere. This grouping was instituted for economic reasons.

In the testing of devices, actual conditions are reproduced as closely as possible. Mixtures of vapor or gas and air at various points over the explosive range are introduced into the interior of the device which is placed in an explosion box containing a similar mixture. The mixture within the enclosure of the device is then ignited and if the mixture in the explosion box is not set on fire it



is evidence that flame did not propagate from the interior of the enclosure of the device to the surrounding explosive atmosphere. Necessarily, a number of such tests must be made, using various concentrations of vapor or gas and air to establish the worst conditions.

### Type of Wiring

It is imperative that the type of wiring employed for Class I locations be the safest available. The rules provide that, "Rigid conduit with threaded, explosion-proof joints and explosion-proof fittings shall be employed as the type of wiring." Rigid conduit provides:

1. Effective protection against mechanical injury to the conductors.
2. A low resistance equipment grounding circuit.
3. Reasonable protection against possible arcs burning through the conduit wall.
4. Explosion-proof, threaded joints or couplings.

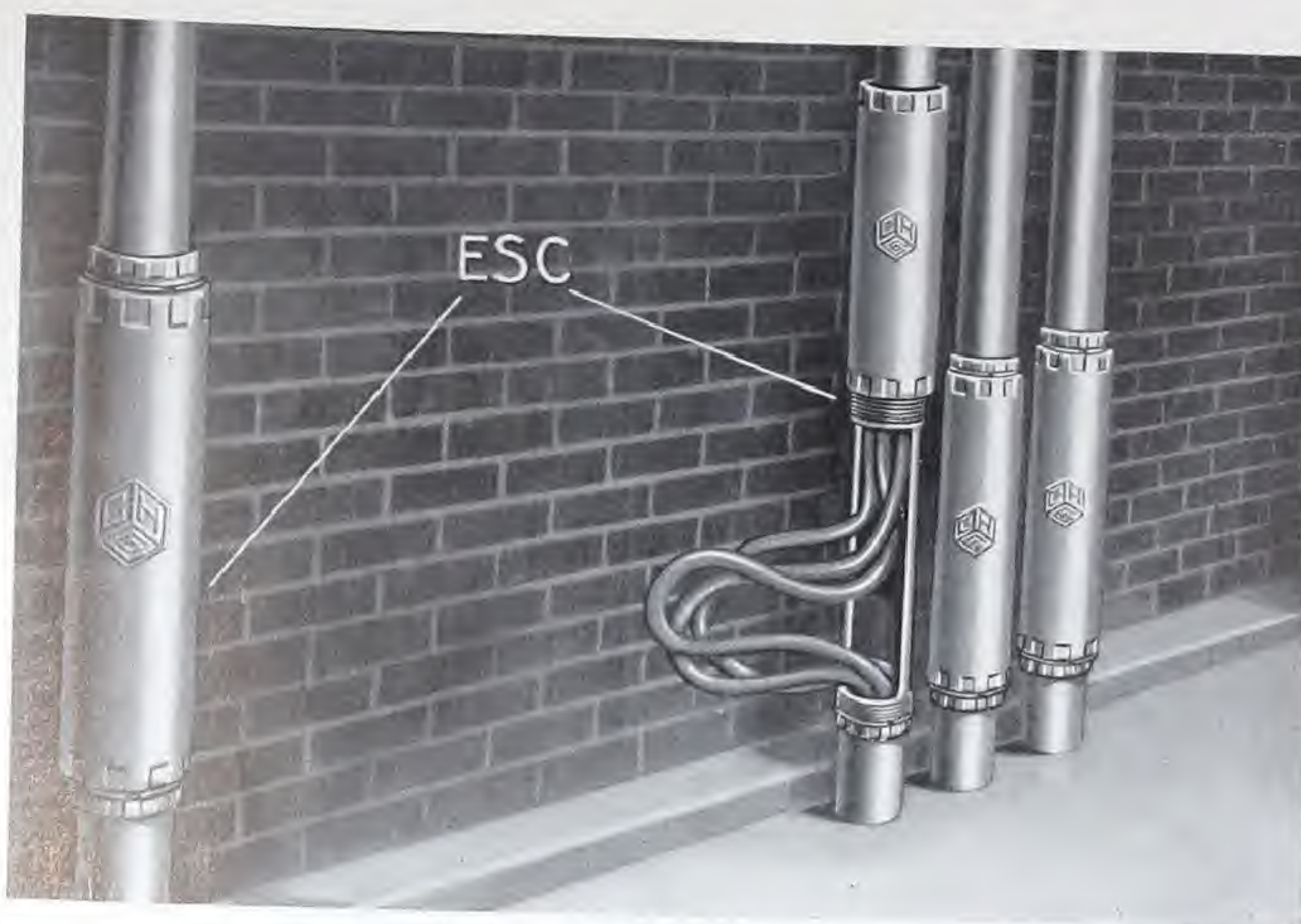
Tests have shown that joints in approved rigid conduit with five full threads engaged are explosion-proof. Running threads which must necessarily be deeply cut, resulting in a rather loose joint, should not be permitted.

It will be found that permission is given in Class I rules to employ approved flexible fittings of the explosion-proof type where it is necessary, as at motor terminals. This is a concession to necessity. Several fittings answering this specification are



Type ECJ Explosion-Proof Flexible Coupling

available. Their use will be limited to those motor installations where it is necessary to shift the motor on its base or where the motion of the motor, as in some types of dry cleaning machinery, renders rigid connection impracticable.



Explosion-Proof Pull Condulets

Having provided an explosion-proof conduit system, it is equally important that fittings, such as outlet boxes, ells, and others, also be explosion-proof. Ordinary fittings are not suitable, for, should an explo-



Type GUAL Explosion-Proof Junction Condulet



Type GUFEX Explosion-Proof Junction Condulet

sion occur in the conduit, flame or hot gases would undoubtedly issue through the joints of the fitting and ignite the surrounding explosive mixture. Complete varieties of explosion-proof fittings for every conceivable purpose are now available.

### Sealing

To prevent the propagation of an explosion from a switch enclosure, motor case, or the like into the conduit systems, or from the point where a conduit leads from a hazardous to a non-hazardous location, the rules require that the conduit be sealed off by a sealing compound which is (1) approved for the purpose, (2) unaf-



Type EYS Explosion-Proof Sealing Condulet



Type EZS Explosion-Proof Sealing Condulet

ected by the surrounding atmosphere or liquids, and (3) has a melting point of not less than 200° F. This sealing compound shall have a thickness of not less than 5/8 of an inch in the sealing well or fitting.

This provision for sealing off conduit runs at motors, terminal boxes, switch boxes, and similar places was inserted in the rule for two reasons. Recognizing that the conduit system, controller cases, motors, and other enclosures are not vaportight, the "breathing action" would cause the vapors or gases, mixed with air, to enter the enclosing system where the mixture might be ignited by an arc from a motor controller, a spark from a motor, or an arc in the wiring. As the first consideration, it is desirable to eliminate the amount of vapor or gas present in an enclosing system subject to a single source of

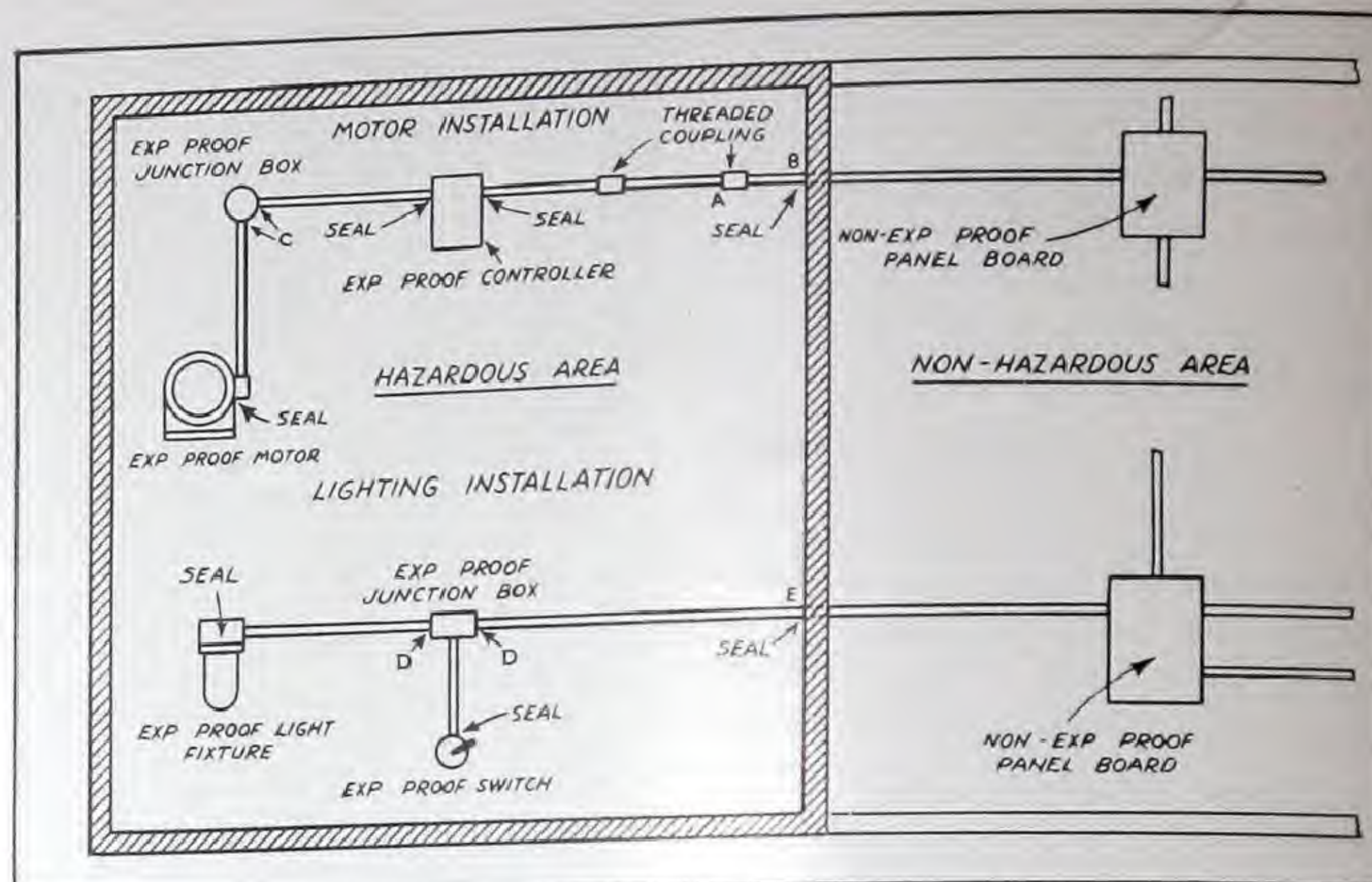


ignition, by sealing off the conduit at the points mentioned and so breaking it into a series of individual enclosures. This is especially important at motor controllers, switches, and commutator type motors where sources of ignition are present in normal operation, but it is recommended that it be done at all fittings and outlet boxes, whether or not containing normally arcing or sparking parts. The second consideration involves the tendency of vapors and gases to diffuse. Assuming the presence of an explosive mixture in the conduit, it would be most undesirable to permit the flow of this mixture through the conduit to a point beyond the hazardous area to a service switch, for instance, which being in a non-hazardous area would be permitted to be of the ordinary enclosed type. It is reasonable to believe that under some conditions a sufficient amount of an explosive mixture of vapor or gas and air would accumulate in this service switch to cause an explosion when the switch was operated. The switch box, not being designed to withstand such explosive pressures, would most likely burst, causing injury or fire.

The illustration on this page shows diagrammatically the points at which sealing is required in a typical installation.

The rules provide further that when conduit runs, four-inch size or larger, are connected to terminal or junction boxes, seals shall be provided within two feet of such boxes. The intent here is to limit to some extent the volume of explosive mixture exposed and accordingly give manufacturers guidance in designing such boxes from the standpoint of mechanical strength, since volume of explosive mixture has an important bearing on the rupturing effect of the resulting explosion.

It is required that seals be made by use of approved sealing fittings unless the enclosure is provided with an approved means for sealing.



**Simple Diagrammatic Illustration of Code Requirements for Sealing:** The area enclosed by the cross-hatched border is intended to represent a hazardous location, while that to the right represents an adjoining non-hazardous location. The upper illustration shows a simple motor installation with the points where sealing is required designated by the word "seal." The seal at the motor is made by the manufacturer as this is required by the Underwriters' Laboratories', Inc., Standard. The seal at point "B" should be beyond the last coupling or fitting in the hazardous area as otherwise vapor or gas would enter the conduit system and pass into the non-hazardous area. If the coupling "A" is so located as to prevent installation of a sealing fitting at that point, the sealing fitting may be installed in the non-hazardous area, but ahead of the first non-explosion-proof device or fitting. Sealing at points "C" is recommended where convenient, especially where conduit runs are long, in order that the volume of gas subject to one explosion be reduced.

In the simple lighting installation shown in the lower part of the illustration the necessary sealing is indicated as above. The seal in the lighting fixture is made by the manufacturer. The same comments as above apply to sealing at point "E" where the conduit leaves the hazardous area. Sealing at points "D" is recommended for the same reasons as given in the foregoing.

Splices or taps must not be embedded in seals since the moisture in the sealing compound may serve to break down the insulation of joints and taps as well as to crowd such boxes and cause short circuits or grounds.

Where there is a possibility of water being trapped in conduit systems because of condensation or other causes, it is necessary to give due consideration to the location of seals and to so install conduit runs that water will collect in explosion-proof sumps which may be drained periodically.

Sealing fittings of several types and suitable sealing compounds have been developed by various manufacturers and listed by Underwriters' Laboratories, Inc. All such sealing compounds must, among other re-

quirements, resist the action of gasoline and its vapors.

## Transformers and Capacitors

It is always to be recommended that transformers and capacitors, especially those containing a liquid that will burn, be located outside of the building proper at a point far enough away from explosive gases and vapors to prevent ignition from a possible burnout. In some instances, however, such installation is not possible or practicable and it becomes necessary to take advantage of the Code provisions for installation within the hazardous area. The Code recognizes two types of transformers and capacitors; first, those containing a liquid that will burn, and second, those containing a liquid that will not burn.



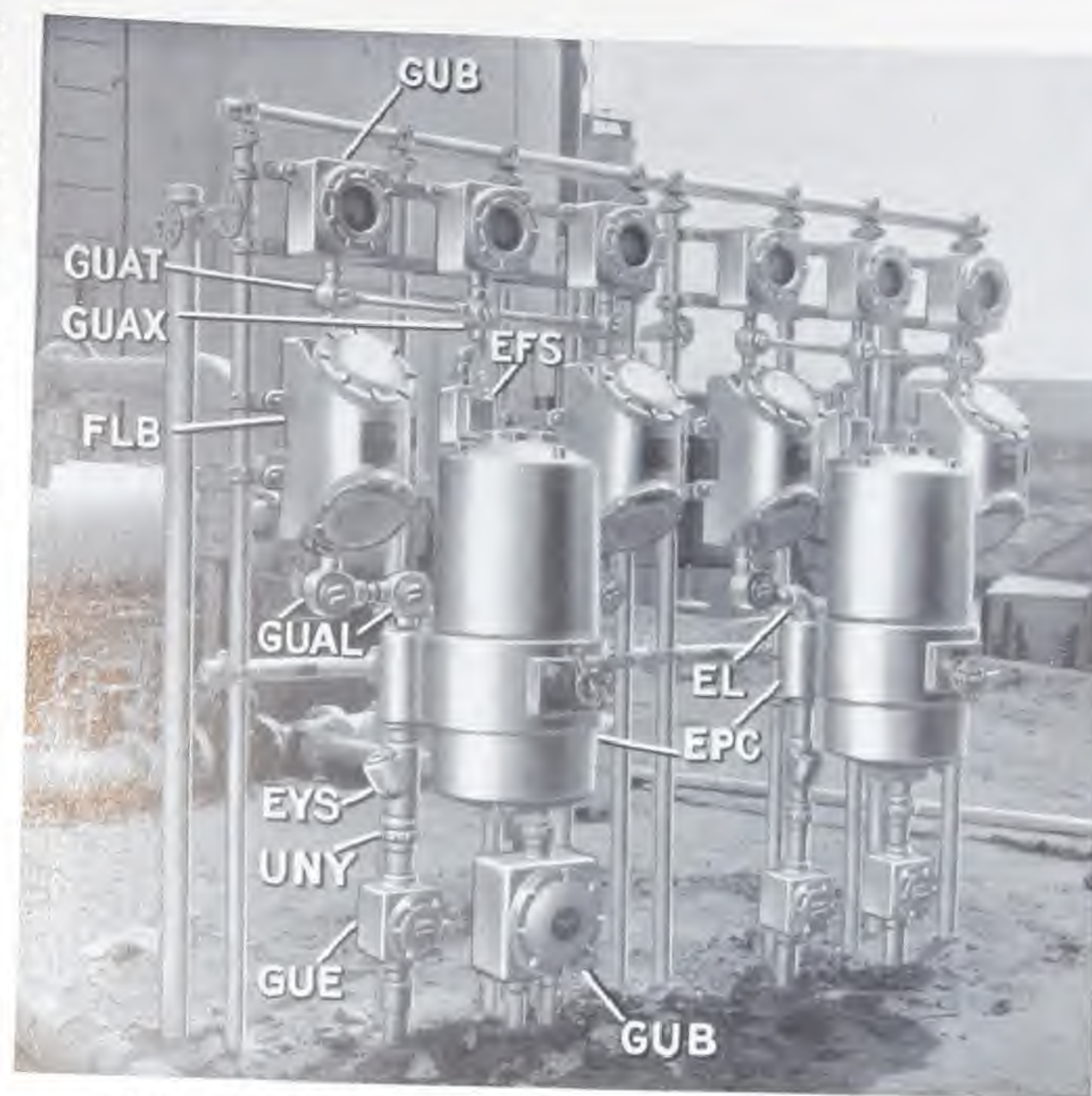
When transformers or capacitors of the first type are located within buildings, it is required that they be installed in reinforced concrete vaults conforming to the specifications given in Sections 4521 to 4528, inclusive, of the Code; that ample ventilation be provided to remove hazardous vapors; and that explosion relief ducts be installed. Vents and ducts are required to be of reinforced concrete leading to the outside of the building, and no openings from the vaults to the interior of the building are permitted.

Transformers and capacitors containing a liquid that will not burn may be installed within the hazardous area if they are enclosed in explosion-proof enclosures or are installed in a room or vault of fire-resistive construction, with unpierced interior walls or partitions to exclude the entrance of hazardous gases or vapors, and if they are provided with ample ventilation to the outside air.

### Service Equipment, Panelboards, and Switchboards

It is extremely desirable that all service equipment, panelboards, and switchboards be located outside of the hazardous area. In the case of an establishment such as an oil refinery where the major portion of the premises may be classed as hazardous, this equipment is best located in a separate building outside of the hazardous area, or one so built and located that explosive vapors or gases will not be present in it in dangerous quantities.

In other instances, where only a small part of the area is classed as hazardous, the service equipment can usually be placed in an adjoining room or building in which the hazardous condition will not be present. As an illustration, in a dry cleaning establishment the service equipment and panelboards may be placed in an addition to the main building but cut off from it by an unpierced



An Assembly of Motor Starters and Other Explosion-Proof Conduits in Oil Refinery

fire wall. This room may also be used to contain remote type motor controllers, a valuable economic consideration in that ordinary non-explosion-proof equipment may be used.

In some instances, however, it becomes necessary to provide for the installation of panelboards within a hazardous area and then it is required that they be of the approved explosion-proof type. Approved explosion-proof panelboards are available, employing circuit breakers which may be reset after tripping without opening the enclosing case—an important safety factor as will be pointed out later.

### Fuses and Circuit Breakers

The rules for Class I locations permit the installation of fuses in the hazardous area provided they are installed in explosion-proof enclosures and, further, that the fuse cutout

bases and their enclosures shall be approved as unit devices for use in explosive atmospheres. There is a definite relationship between a fuse of a given capacity and the enclosure designed to contain it, hence the need for unit approval. An important consideration in the question of permitting fuses in a Class I location is the need for opening the enclosure for the replacement of fuses. This objection may be overcome by designing some type of interlocking feature which will disconnect the circuit automatically when the case is opened, but to date such an assembly has not appeared. Because of this factor, circuit breakers in explosion-proof enclosures are to be preferred. Approved explosion-proof circuit breakers of several designs are now readily available and all of these may be reset, when tripped, without opening the enclosing case.





Explosion-Proof Motors and Other Condulets in an Oil Refinery

### Motors and Generators

From our point of view there are two general types of motors; first, those having commutators, slip rings, or other sparking parts; and second, squirrel-cage induction motors. Although motors of the first type are more hazardous than the second when operating in a hazardous atmosphere, it was deemed necessary to require that all motors be of types approved for operation under the particular conditions to which they will be exposed. A motor, to be considered safe for operation in Class I locations, must necessarily be so designed that, whether in normal operation or in case of a fault, such as a burnout, it will not cause ignition of the hazardous material outside of the motor. To fill this specification, a motor of the explosion-proof type is required and only those which have been subjected to rigid tests and properly identified should be accepted. Except in the case of fractional horsepower motors, all motors are equipped with explosion-proof terminal boxes and the leads from this box into the motor are sealed as required by Class I rules. Fractional horsepower motors are often not supplied with terminal boxes because they might be sold to the manufacturers of devices, such as gasoline pumps, who complete the assembly.

In some instances it may be desired or necessary to isolate a motor from the hazardous area and thus make possible the use of open type motors. However, attempts to isolate open type motors from hazardous vapor or gas atmospheres have not always proved successful, because it is difficult to protect the shaft openings so that entrance of the flammable gases or vapors will be prevented. As a general rule, approved Class I motors properly selected with respect to the vapor or gas atmosphere are much to be preferred to attempts at isolation. Probable exceptions are motors used where pyroxylin lacquer residues,

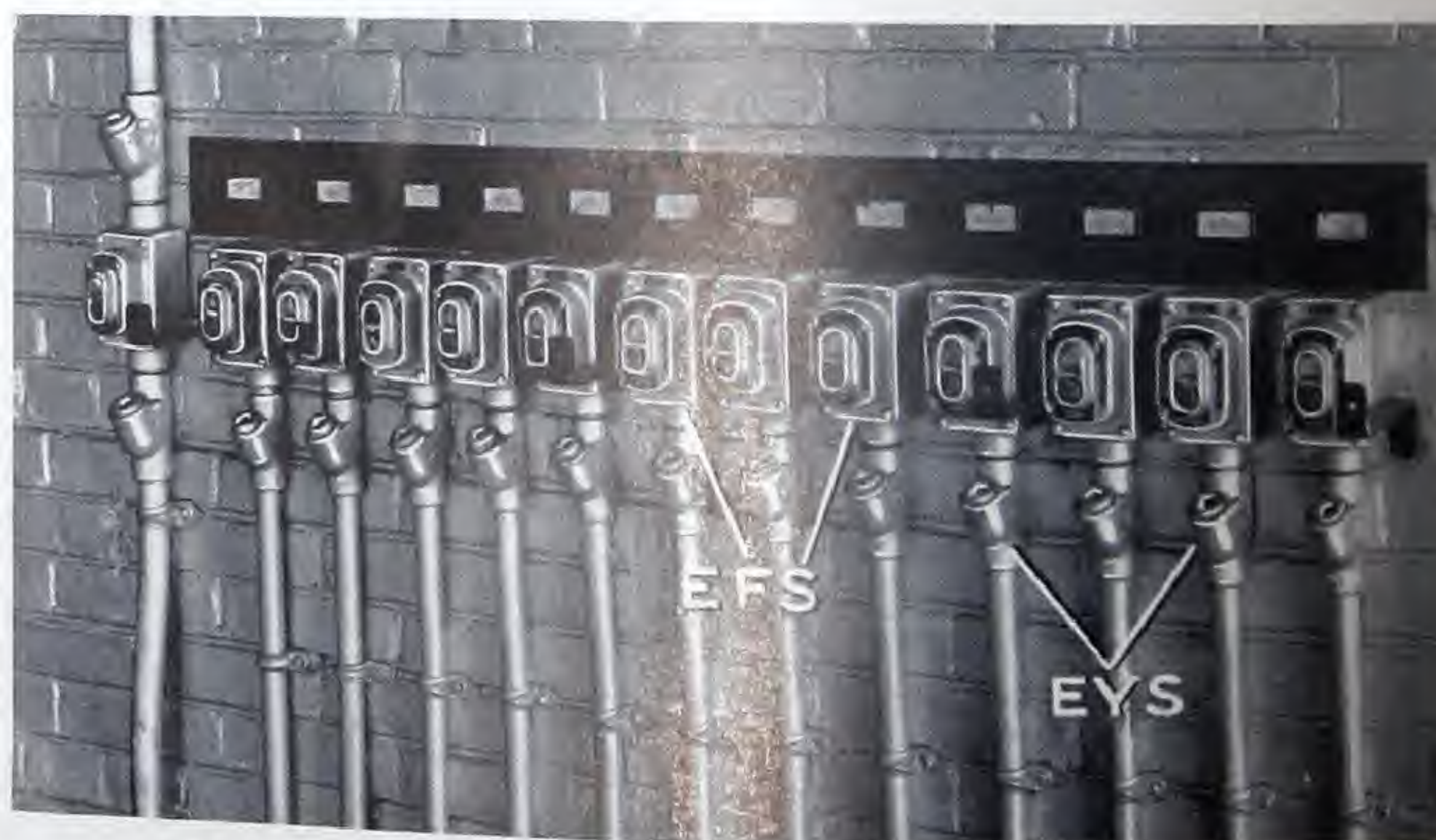
pyroxylin plastic, or carbon disulphide vapors which have extremely low ignition points may be present.

Generators installed in hazardous locations are subject to the same comment as the foregoing applying to motors. However, it is usually practicable to place generators in some non-hazardous location where the standard unenclosed machine may be used.

### Motor Controllers, Overload Protective Devices, Switches, and Resistance Devices

The rules for Class I locations provide that motor controllers, overload protective devices, switches, relays, the switches and contactors of auto-transformer starters, resistance or impedance devices, or other devices or apparatus, which in their normal operation tend to create arcs, sparks, or high temperatures, be not installed within the hazardous area unless such devices or apparatus are of a type approved for use in explosive atmospheres.

In the case of motor controllers, those of the remote control type can often be selected and located at a point outside of the hazardous area, either in a specially built structure or in an adjoining room cut off from the hazardous area. Push button sta-



Explosion-Proof "Stop-Start" Station Condulets in an Oil Refinery



tions or auxiliary control switches of the approved explosion-proof type may then be located in the hazardous area for convenient operation. In some instances this arrangement is not convenient or desirable and then recourse must be taken to the use of approved explosion-proof equipment in the hazardous area. Only rarely are resistance or impedance devices installed except as a part of motor controllers but these devices are also subject to the foregoing comment. Switches are also required to be of the approved explosion-proof type if in the hazardous area. As in the case of motors, listing of controllers, switches, and the like by Underwriters' Laboratories, Inc. is by groups, depending on the particular type of explosive atmosphere in which installation is intended. A number of types of controllers and switches have been listed for the various manufacturers of this type of apparatus.

### Heating Appliances

Electric heating appliances for Class I locations present a problem rather difficult to solve. The temperatures reached by the usual heating devices are often far above the apparent ignition temperatures of the various gases or vapors in the atmospheres of which they would be installed, and so would furnish an excellent source of ignition to cause an explosion. To control such a situation the rules for Class I locations require that electric heating appliances be of a type approved for the particular location or type of material in or with which they are used. To date no such heating appliance has been listed, but possibly in the future one may be developed, as, for instance, an electric sterilizer for hospital operating rooms.

Steam, hot water, or hot air heaters are to be recommended for general and process heating in all hazardous locations.

In the design of lighting installations for Class I locations, every effort should be made to eliminate the need for portable lights. This requires more than ordinary study and skill, especially where numerous machines are installed or where the character of the work done requires light of high intensity. However, it appears that in spite of the best intentions, portable lights will be used and, hence, the rules provide for the construction and installation of both fixed and portable units. It should be emphasized that portable lights are undesirable and should be eliminated so far as possible, for they are dangerous even at their best.

The unenclosed and unguarded incandescent lamp, whether portable or fixed, is a distinct hazard, as the breakage of such a lamp is an almost unfailing source of ignition. Further, an arc may be formed at the center contact of the lamp if it should back out of the receptacle by vibration or otherwise.

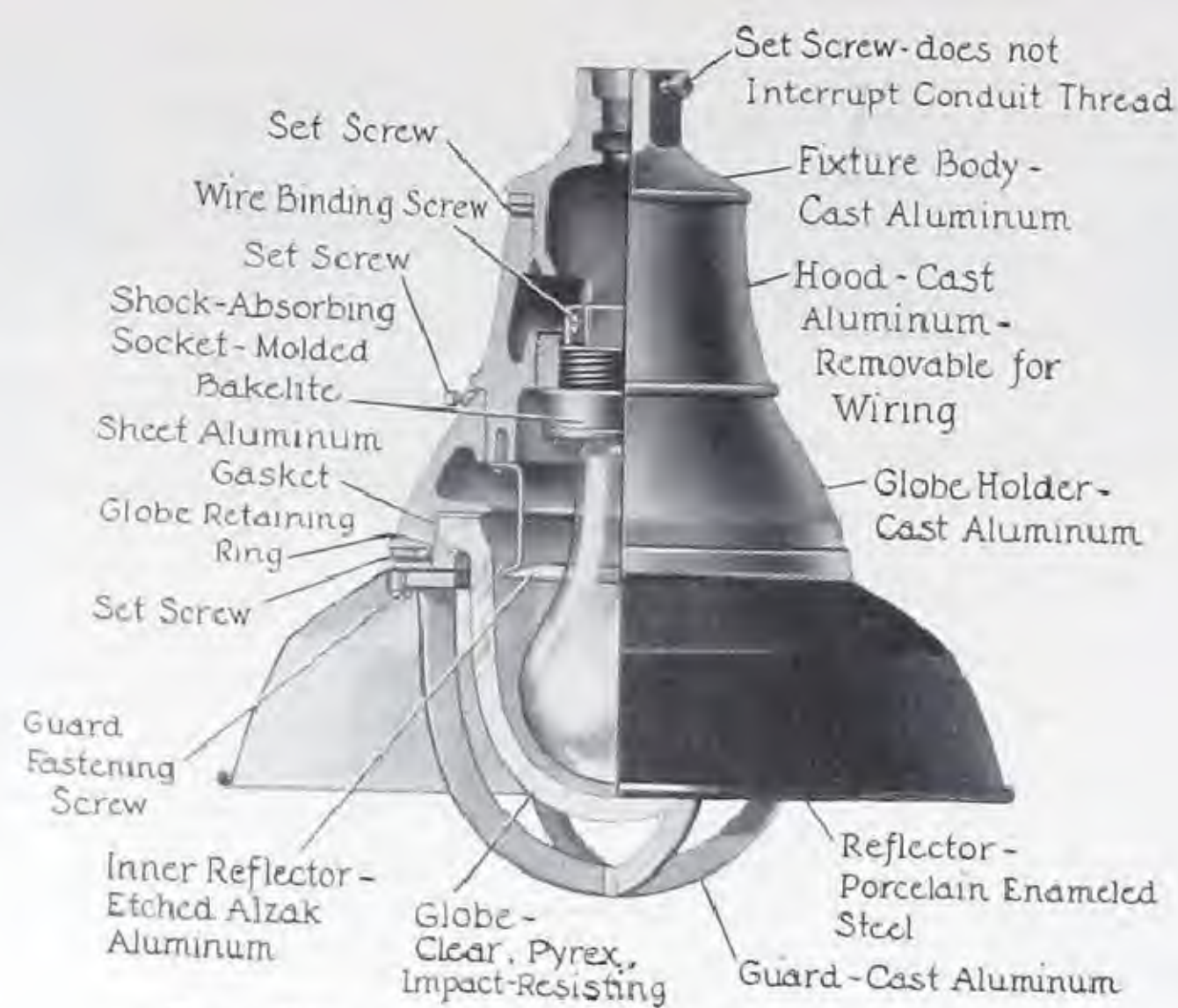
Fixed lighting units are required to be enclosed in protective globes of approved design. The temperatures reached by some parts of an incandescent lamp, especially one of high wattage, is often in excess of the apparent ignition temperatures of certain vapors and gases. By pro-

viding such lamps with enclosing globes or with specially designed fixtures with heavy glass lenses, the maximum temperature of exposed parts is considerably reduced and to some extent breakage is prevented.

To reduce maximum fixture temperatures it is often to be recommended that oversized enclosing fixtures be used and also that a larger number of lower wattage units be used rather than a smaller number of higher wattage units to obtain the same intensity of illumination.

Where fixed lighting units are exposed to breakage, they are required to be protected by substantial metal guards or other approved means. Heavy glass lenses may be accepted as "other approved means" if found to have the proper strength and characteristics. Only in rare instances, such as in the case of high ceilings, should fixed lighting units be considered not exposed to breakage.

Lighting units of the fixed type are to be directly connected to the conduit system or outlet box at the ceiling except where rigid conduit hangers or flexible connectors approved for explosive atmospheres are used. It is important that rigidly mounted fixtures be strongly supported. Drop cord pendants are not permitted by the rules for Class I locations.



Type EVA Explosion-Proof Lighting Fixture

### Lighting Installations





Type EFSC  
Explosion-Proof Switch Condulets

Switches for lighting installations, if within the hazardous area, are required to be of the approved explosion-proof type. However, it is often possible to install the switches outside of the hazardous area and so permit the use of the ordinary non-explosion-proof type.

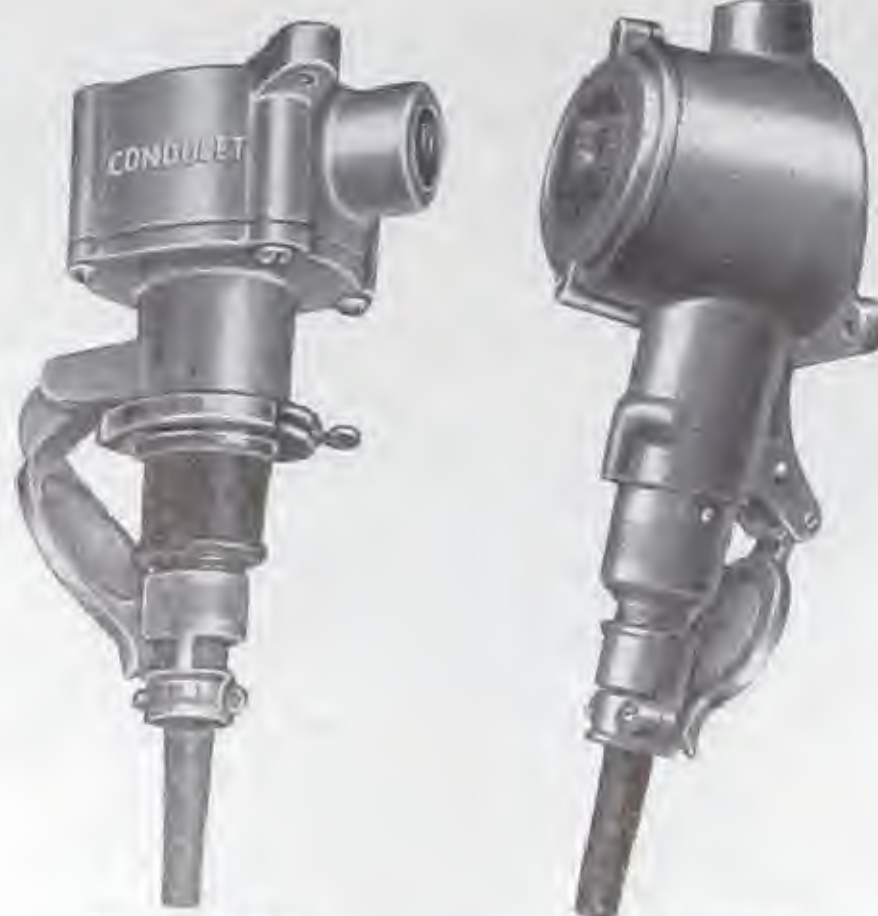
As has been previously stated, the use of portable lights and all other portable devices should be avoided if at all possible. However, the rules make provisions for such devices and for their cords and connections.



Type EVH  
Explosion-Proof Hand Lamp

Portable lights are required to be protected by both an enclosing globe and a substantial guard, and the entire assembly especially approved. Sockets are required to be of the keyless type.

Cords for portables shall be of the type designed for hard usage, such as Type S. The rules require that the flexible cord contain an extra insulated conductor, finished to show a green color, to form a grounding connection for the exposed metal parts of the portable device.



Type CPS  
Type FSQ  
Explosion-Proof Receptacles  
and Plugs

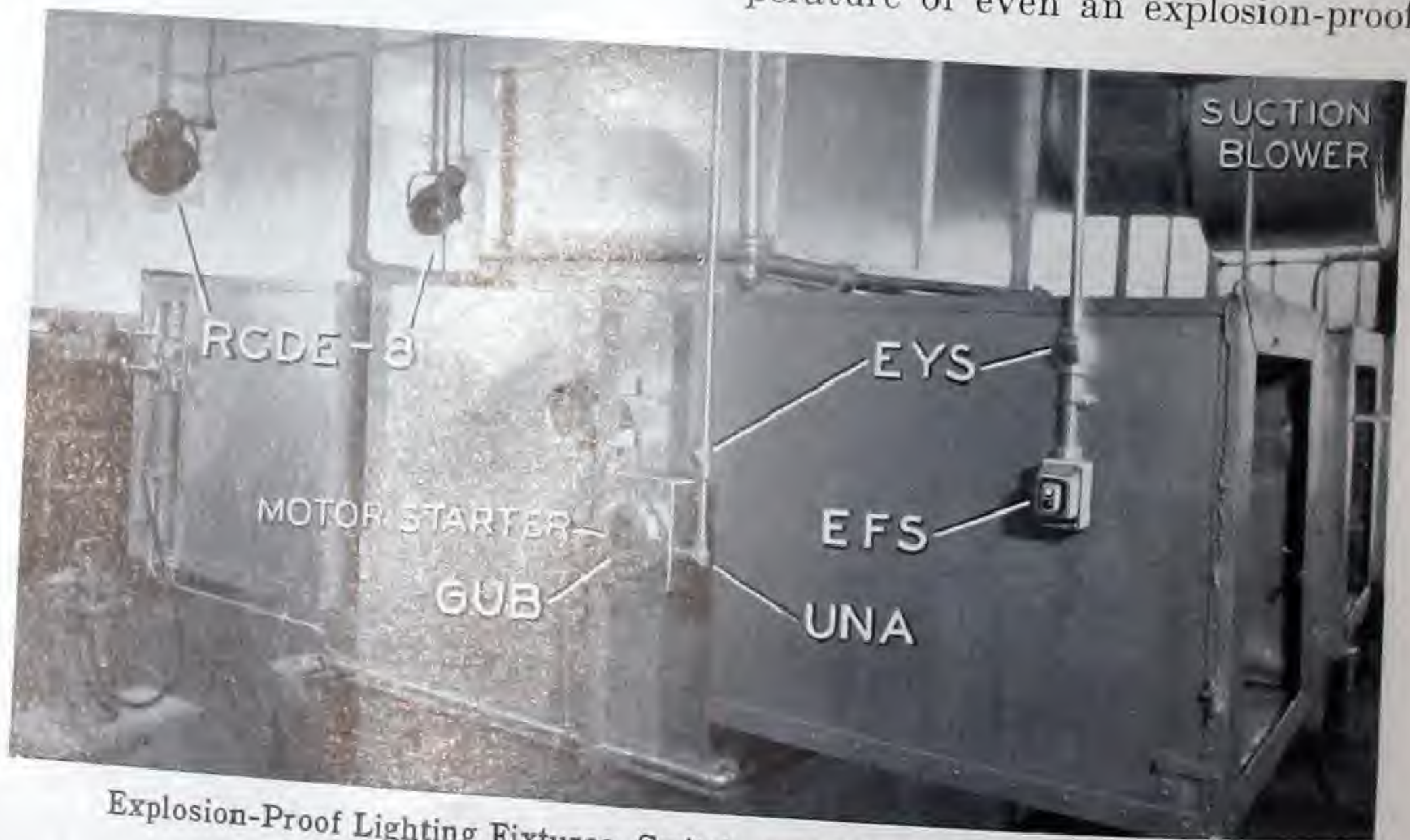
Receptacles and plugs for use with portable cords may be one of two types. First, they may consist of an assembly of an explosion-proof switch combined with a plug and receptacle and so arranged that the plug cannot be removed unless the switch is in the "off" position. Second, they may consist of a plug and receptacle so designed that when the plug is removed the are is sealed within an explosion-proof chamber or enclosure. Both types effectively remove the hazard which would be present were the resulting are permitted to occur in the open. It should be mentioned that both types are required to be of the polarized design to provide a connection for the grounding conductor of the portable cord.

When it is desired to connect portable cords directly to supply conductors, which probably will be but rarely, the rules require that the cord, in addition to first being made mechanically secure, soldered, and heavily taped, shall then be securely supported so that the probability of a break in the conductors at the point of attachment will be minimized. There is available a special fitting for this purpose, which provides a chamber for making the connections, a compression grip device to take the strain from the joints, and also facilities for sealing.

### Special Rules for Spray Booths

Motors, lamps, switches, or other electrical devices are not permitted to be installed in spray booths, in ducts connected therewith, nor in any location where there is a possibility of the spray lodging on them. It is also required that the auxiliaries of mercury vapor lamps, which include open resistors, be offset a distance of at least 10 feet from the working face of the spray booth.

Compliance with these requirements is especially important when pyroxylin lacquers are used as the residue or dust of such lacquers break down at temperatures as low as 212° F., or much below the temperature of even an explosion-proof



Explosion-Proof Lighting Fixtures, Switch, and Motor Starting Condulets in  
Spray Paint Department



lighting fixture. Spray booth interiors may be lighted by means of floodlights placed at least 10 feet away from the working face of the booth or by explosion-proof lighting fixtures placed behind and outside of wire glass panels in the walls of the booth.

## Gasoline Discharge Devices

Underwriters' Laboratories, Inc. has established standards for the design and test performance of motor driven gasoline discharge devices for filling stations. Where formerly the pump itself was examined and tested as an individual device, the new procedure provides for the examination, testing, and listing of the entire pump assembly, including the motor, its control switch, and wiring as a complete unit.

The standards provide requirements which are in thorough conformity with the rules for Class I locations except that the lights within the pedestal used for lighting the dial are not yet required to be enclosed in explosion-proof fixtures. This latter will undoubtedly come later as suitable fixtures are developed. The dome light may be considered outside the hazardous area, provided a seal is made under the dome fixture and its socket so as to

prevent vapors passing into the fixture. The switches for controlling the lights, however, if in or on the pump are required to be of an approved explosion-proof type.

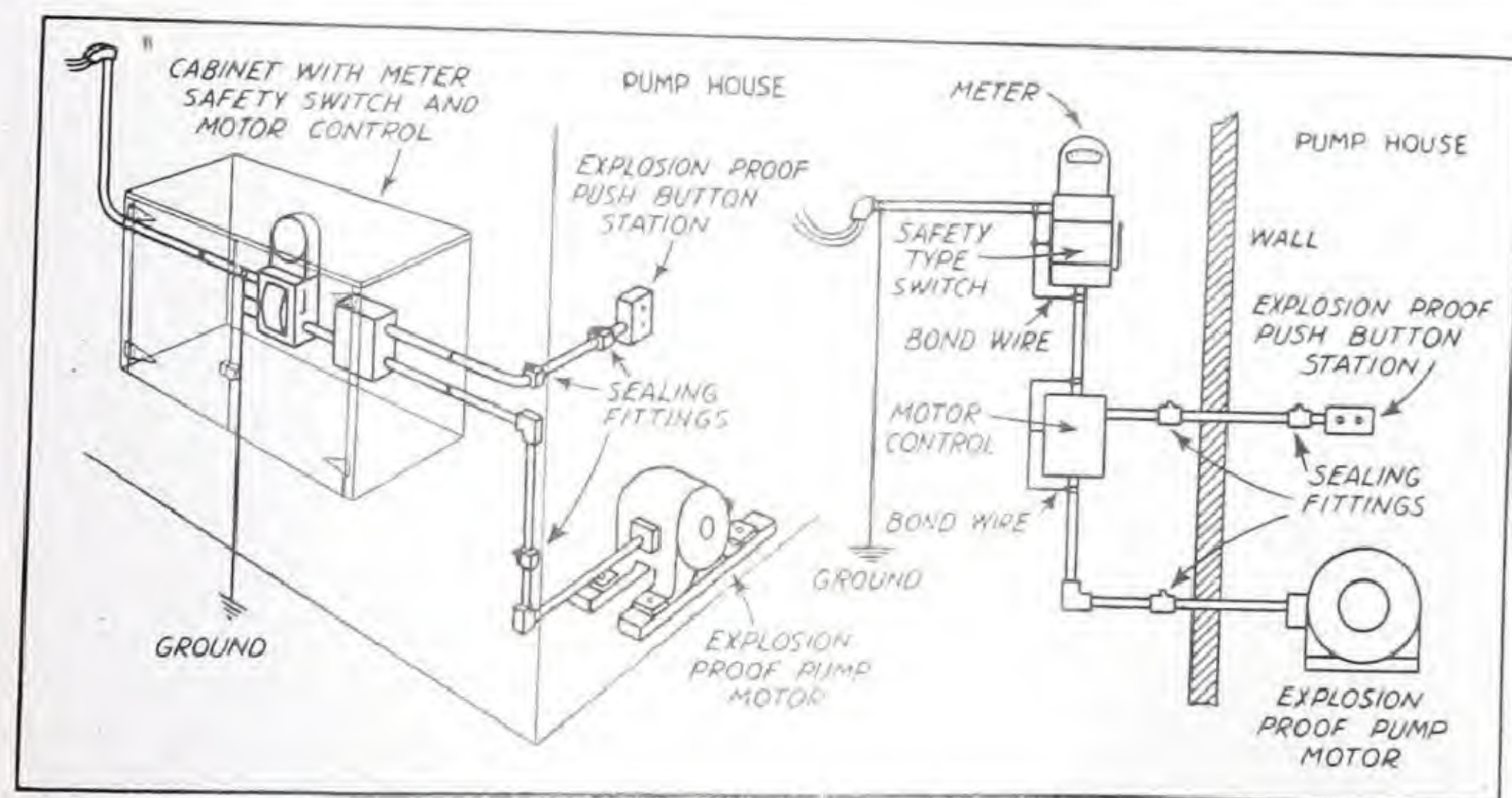
The device is usually received at the filling station for installation, completely wired down to the explosion-proof junction fitting located in the base of the pump. The installer runs a circuit from the filling station building to the pump and makes the necessary conduit connection to the junction fitting in the base of the pump. He then seals off the conduit with a suitable compound at an approved sealing fitting in the base of the pump.

Many old style pumps are being changed over to comply with the above standard. In this connection it should be emphasized that all junction boxes and other fittings should be of the explosion-proof type and that only rigid conduit with threaded joints should be used. Armored cable, park cable, and wiring materials other than rigid conduit are not permitted by the rules.

## Grounding

The proper grounding of the non-current-carrying parts of equipment is very important because of the fact that, should an accidental ground

occur anywhere in the system within the hazardous area, the service fuses, or other circuit protection, should open immediately and clear the circuit. To provide for a reliable grounding circuit, provisions additional to those in Article 250 of the Code are included. These require that bonding jumpers or other approved means be used rather than depending on the locknut and bushing type of contact. Inasmuch as positive threaded connections are used at all points within the hazardous area, and as the method is recognized as approved, the bonding jumpers need be used only up to and including the point where connection is made to the water pipe or other grounding electrode. Special attention should be given to the matter of securing a good ground and to the installation of the grounding conductor and its connections.



**Suggested Pump Motor Installation for Bulk Gasoline Station:** Note that service equipment and magnetic motor controller are located in a cabinet on the outside of the pump house leaving only the pump motor and the push button station within the hazardous area. The necessary sealing fittings to be provided by the installer are also indicated.



**Type ETB**  
**Manual Explosion-Proof Telephone**

## Signal and Communication Systems

In many types of Class I locations, wide use is made of various signal and communication systems. Such systems, unless employing proper apparatus and properly installed, may serve as the ignition medium for a serious explosion or fire. This fact is recognized in the rules for Class I locations which require that,



irrespective of the operating voltage, bells, buzzers, horns, sirens, push buttons, switches, and the like be of a type approved for use in explosive atmospheres. All wiring for such systems is required to be in rigid conduit of explosion-proof design, as previously discussed. A fairly complete line of signal and communication apparatus, including explosion-proof telephones, has been developed and is readily available.



## CHAPTER IV

### Class II Hazardous Locations

**C**LASS II locations are defined in the Code as being those where:

(1) combustible dust is thrown, or is likely to be thrown, into suspension in the air in sufficient quantities to produce explosive mixtures, or (2) where it is impracticable to prevent such combustible dust from collecting in such quantities on or in motors, lamps, or other electrical devices that they are likely to become overheated because normal radiation is prevented.

Thus we have two conditions to contend with, the first of which may be present without the second necessarily prevailing. In other words, due to excellence in housekeeping, efficiency of dust control systems, or for other reasons, it is conceivable that in some cases there may be an explosive mixture of dust present in a particular location, but at the same time there may not be sufficient dust to form a heat insulating blanket on the windings of motors or other devices. On the other hand, it would be practically impossible for the second condition to exist without the first.

Combustible dusts, whether of a carbonaceous or metallic nature, form explosive mixtures when mixed with air in proper proportions. When a finely divided combustible dust is in suspension in air so as to give access to an abundant supply of oxygen, combustion once started usually proceeds with explosive rapidity. Without having seen the results of a dust explosion, it is difficult for one to appreciate the terrific forces which

are set up. The writer has seen reinforced concrete walls seven inches thick shattered to bits by an explosion of grain dust. In one cereal mill explosion it was reported that debris was found at a distance of two and one-half miles from the plant.

Whether an explosion occurs or not, it is a fact that quantities of combustible dust in a plant add greatly to the traveling speed of flames. Very often, especially in buildings of more or less open construction, fire may occur without the usual detonation associated with explosions, yet flames may be communicated very rapidly through the structure in a series of flash fires as a result of the presence of dust. In a plant handling or producing a combustible dust, every fire, no matter how small, should be regarded as a potential dust explosion. This emphasizes the need for extreme care in eliminating or guarding all possible sources of ignition.

Tests and actual experience have demonstrated that there exists in industry a wide variety of dusts which form explosive mixtures with air. Among the most common are the following:

Grain Dusts	Spice Dust
Rice Dust	Cocoa Dust
Starch Dust	Sulphur Dust
Flour Dust	Hard Rubber Dust
Wood Dust	Dextrine Dust
Coal Dust	Sugar Dust
Cork Dust	Soap Dust
Dried Milk Dust	Metal Dusts
Carbon Black	

#### Typical Class II Locations

Following are some of the more common Class II locations with estimates regarding the extent of the hazardous area in each. As in the case of Class I locations, each particular plant must be judged on its own merits due to the fact that the construction and arrangement of the building and the nature of the equipment have decided effects on the extent of the hazardous area. However, especially in the case of grain elevators and flour and feed mills, there is sufficient similarity between plants to make possible more specific estimates regarding the extent of the area.

The inspector is referred to the regulations for the prevention of dust explosions developed by committees of the National Fire Protection Association and adopted by the National Board of Fire Underwriters. These regulations will be found very useful in obtaining a clearer understanding of dust explosion hazards and the means for preventing them.

**Grain Elevators.** This type of plant may be divided into three classes: terminal elevators, mill elevators, and country elevators. The dust hazard is present in all of these, but owing to the greater volume of grain handled and the greater speed at which operations are conducted, the dust hazard in the terminal elevator is usually more severe than in the other classes. In the case of





Grain Terminal and Feed Mill

flour or feed mills of large capacity, the mill elevators associated with them approach in character the terminal elevator. The hazardous area in any elevator should be considered as including all parts of the head or work house, the bin or tank section, the drier house, and the car or dump shed. This exempts warehouses, offices, power houses, shops, laboratories, and similar areas usually practically free of dust. Offices such as used by weighmen and foremen, as well as locker rooms within the elevator structure proper, are also to be considered as non-hazardous locations provided openings into them are adequately protected to prevent the entrance of dust in any appreciable quantity.

**Flour Mills.** The hazardous area is assumed to include all parts of the mill building proper, the cleaning department, and the elevator as qualified previously. Laboratory and office rooms or sections, warehouses, shops, locker rooms, and power rooms, if so cut off as to be practically free of dust, are to be judged as non-hazardous.

**Feed Mills.** The hazardous area includes the main building in which

the grinding, mixing, and packing are done, excepting those rooms used for shop, locker, office, or laboratory purposes. The grain receiving, cleaning, and bulk grain storage department, usually in the form of an elevator, should be judged a hazardous location with exceptions as mentioned under "Grain Elevators." Warehouses used for the storage of sacked materials may usually be judged as non-hazardous locations unless, as a part of the feed mill proper, it is impracticable to exclude dust from them.

**Rice Mills.** The rice elevator, or receiving and rough cleaning and storage department, and the hulling, milling, and polishing building make up the hazardous area. The packing and warehouse sections, if separate buildings, are in the non-hazardous class.

**Corn Starch Plants.** Establishments of this type include a grain elevator where the shelled corn is received, cleaned, and stored pending processing. This section is to be treated as mentioned under "Grain Elevators." When the corn enters the main plant it is placed in steep

tanks and from this point on to the dry kiln the process is of a wet nature, thus eliminating explosion hazards. The milling process by which the dried lump starch is pulverized is similar to that employed in flour mills. The gluten feed department receives part of the material washed from the corn and the operations in this section are somewhat similar in hazard to those of a feed mill. The hazardous areas in starch plants include the elevator and the sections of the main plant beginning at the dry kiln room and continuing through the milling and packing departments. All of these should be considered as Class II locations except rooms well cut off and used for non-hazardous purposes. Probably large parts of the dextrine and gluten feed departments should also be regarded as Class II locations.

**Coal Elevators.** Establishments of this class are to be judged as suggested under "Grain Elevators." While the elevating conveyor may be out in the open, the tunnels and galleries are usually very dusty and therefore warrant this treatment.

**Wood Flour Factories.** The pulverizing process is usually required to be conducted in a separate building or at least in a cut-off section of the main building. Only the section or department containing the pulverizing process needs be considered as a hazardous location.

**Woodworking Shops.** The dust explosion hazard is ordinarily not present in establishments of this type except in the sawdust or shavings vault. When sanding is done, the condition is aggravated somewhat. The vault should be considered as a Class II location. However, in many woodworking establishments it is difficult to prevent sawdust from blanketing motors, thus preventing proper radiation of heat. The inspector is then justified in requiring the use of motors of the enclosed type and asking that controllers be



either of the dust-tight type or so located that they will not be exposed to excessive dust.

**Cork Pulverizing Processes.** In general the hazardous area is confined to the building or section where such pulverizing is done.

**Sugar Refineries.** The pulverizing department should be regarded as a Class II location.

**Metal Dust Processes.** The process of pulverizing or spraying the dusts of aluminum, tin, bronze, magnesium, and other metals should be scrutinized closely and at least the rooms or sections in which the pulverizing is done should be regarded as Class II locations.

**Miscellaneous Pulverizing Processes.** The pulverizing of many other types of materials creates definite dust hazards and, since the processes and hazards are similar, they will be considered under a single head. Such materials include spices, cocoa, sulphur, hard rubber, soap, dried milk, and others. Ordinarily, the pulverizing process is required to be carried on in a separate section cut off from the main plant. In this case only that section needs to be considered a Class II location.

**Breweries and Distilleries.** When the malting is done at the brewery, the grain receiving, cleaning, and storage department is nothing more or less than a grain elevator and should be treated as discussed under "Grain Elevators." The drying house or tower and the milling department and dust bins are Class II locations. The same applies to the building in which the spent mash or grain is dried and sacked for feed.

## General Nature of Apparatus

The general intent of the rules for Class II locations is to prescribe types of enclosures for electrical apparatus and wiring which will, first, prevent the occurrence of electrical arcs or sparks in the immediate pres-

ence of combustible dust which is likely to be in suspension in the atmosphere; and second, prevent the ignition of combustible dust which may have accumulated in or on motors, lamps, or other electrical apparatus to the extent of interfering with the normal radiation of heat. It has been found practicable to build dust-tight enclosures for apparatus such as switches and motors, that is, enclosures so constructed that dust will not enter.

The term "dustproof," though often employed in referring to equipment intended for dusty locations, has little significance, as Article I of the Code defines this term as "so constructed or protected that an accumulation of dust will not interfere with its successful operation."

Underwriters' Laboratories, Inc. has developed standards for the construction and test performance of apparatus intended for use in Class II locations. In general, these standards prescribe, first, that the enclosing case shall be dust-tight, and second, that the temperature which such an enclosure reaches when blanketed with dust shall not be sufficiently high to reach the ignition temperature of the particular dust concerned. As was the case for apparatus intended for installation in Class I locations, it was found that various dusts possessed individual characteristics and varying degrees of hazard and, therefore, a division was made with respect to the type of dust. These divisions into groups are as follows:

Group	Dust Mixture
E	Metal Dust
F	Coal or Carbon Black Dust
G	Grain Dust

It should be kept in mind that while a Group F motor is satisfactory for a Group G atmosphere, the reverse does not hold true.

In testing a piece of apparatus submitted for listing for Class II lo-

cations, actual conditions are reproduced and, in addition, are accelerated so as to approximate the effect of several years of operation in a dusty atmosphere. If dust enters the interior, the particular piece of apparatus is not dust-tight and is not eligible for listing. A further test is then made to determine whether the temperature attained by the enclosure when the device is operating fully loaded and when blanketed with dust is sufficiently high to cause ignition of the dust. As an example, in these tests the limiting temperature of fixtures and apparatus for operation in Class II, Group G locations is taken at 329° F.

It is sometimes found that an installer attempts to render ordinary apparatus dust-tight by gluing or otherwise fastening strips of felt on joints or cabinet doors. Such makeshifts should be rejected, for the felt strips soon become loosened or displaced. It is also found in some instances that so-called marine or vaporproof apparatus is employed. This may or may not be dust-tight, the inspector having no assurance that such apparatus will exclude dust. Only in instances where truly dust-tight equipment of the type desired is not yet on the market should the use of such apparatus be permitted and then only in extreme cases.

At this point it may be well to call attention to the fact that the standards of Underwriters' Laboratories, Inc. on switches, circuit breakers, and controllers cover not only those of the air break, dust-tight type, but also those of the oil immersed type. The latter are required to be in dust-tight cases even though the load breaking contacts are immersed in oil.

With the general nature of apparatus for Class II locations before us we shall now proceed to discuss the intent and application of the rules.



## Type of Wiring

The type of wiring for Class II locations is limited to rigid conduit. Threaded connections are required at couplings. Junction boxes, pull boxes, and similar fittings may be either the threaded type or the type employing locknuts and bushings. However, if the latter type is used, it is required that bonding jumpers be used around them. This will be discussed later under "Grounding." In most instances the threaded type is preferable. The fittings mentioned above, also "ells," and "tees," need not be of the dust-tight type except where dusts are electrically conductive, as it is felt that the small amount of non-conductive dust which can enter the system through such fittings will not be harmful.

It has been found that in order to render switch cabinets, fuse boxes, controller cases, and other enclosures containing normally arcing or sparking parts permanently dust-tight, as required by the rules, it is necessary to specify that the conduit connections to them be of the threaded type.

While the rule regarding type of wiring specifies rigid conduit only, it is permissible to employ reasonable amounts of auxiliary steel gutters at meter centers, distribution centers, and similar points. Where conduit is attached to such gutters by locknuts and bushings, bonding jumpers are required.

Permission is also given to use a short length of flexible steel conduit where flexible connections are necessary, as at motor terminals. Its use, however, should be avoided whenever possible in an attempt to obtain maximum safety.

Unlike the rules for Class I locations, the rules for Class II locations do not require that conduit be sealed off where it enters enclosures, with the exception of listed Class II motors, where it is required that the terminal leads be sealed or closely

fitted to prevent the entrance of dust into the motor through the terminal fitting.

## Transformers and Capacitors

Transformers and capacitors should always be located outside of buildings proper whenever possible and in most cases this can be arranged conveniently. When so located, they and their combustible supports should be at least ten feet horizontally from any exposed combustible parts or unprotected openings of all buildings. The Code recognizes two types of transformers and capacitors: first, those containing a liquid that will burn, and second, those containing a liquid that will not burn.

Transformers and capacitors of the first class may be installed within buildings only if in a reinforced concrete vault conforming to Sections 4521 to 4528, inclusive, of the Code. It is required that the vault be equipped with air-cooling vents and pressure-relief openings of non-combustible construction extending to the outside of the building. Any openings into the building shall be protected by double, standard fire doors.

Transformers and capacitors containing a liquid that will not burn may be located within the hazardous area provided they are of dust-tight construction with dust-tight terminal enclosures, or are enclosed in dust-tight, fire-resistive rooms. Transformers and capacitors of this class are required to be equipped with pressure-relief devices.

## Surge Protection

Even when wiring is in rigid steel conduit, and motors, controllers and the like are of approved dust-tight design, it has been found that lightning and other high voltage surges cause considerable damage to electrical equipment and wiring, often resulting in serious fires and explosions. This is especially true of

grain elevators and flour mills located in rural areas where long transmission lines are involved. It has been found that good protection against damage from these high voltage surges can be had by installing surge protection equipment at each service. Provision for such protection is now made in the rules for Class II locations in areas where lightning disturbances are prevalent. This protection includes the installation of suitable lightning arresters and surge protective capacitors on the line side of the service switch. The interconnection of all grounds is a part of the protective system, which consists of the interconnection of the lightning arrester and secondary neutral ground, and the interconnection of the neutral or circuit ground with the equipment ground within the building. Suitable surge protective capacitors are available from several manufacturers of electrical equipment.

## Service Equipment, Panelboards, and Switchboards

Service and circuit protection equipment involve switches, fuses, circuit breakers, metering equipment, and associated apparatus. These in their normal operation entail the production of arcs and sparks which, if occurring in the presence of combustible dust, may result in an explosion; hence the need for either adequately enclosing such apparatus or removing it to a location where combustible dust is not present.

In most instances, convenient arrangements can be made to place the main service equipment, panelboards, and switchboards in some location outside of the hazardous area, such as a power house, office, warehouse, or specially built exterior switch house.

Where, for reasons of economy or convenience, this equipment must be within the hazardous area, the rules provide for its location in a room of suitable construction. In





Type DVP  
Dust-Tight Panelboard

plants of the fire-resistive type, the room should be built completely of non-combustible material such as concrete, tile, or brick, but when the building is of a combustible nature, a room of steel lath and cement plaster on a framework of wood or steel is permitted. Necessarily, the floor must be covered with concrete in order that there be no unprotected combustible material within the room. Any openings from the room into the main plant must be provided with tight-fitting, self-closing fire doors, and so arranged that dust will be excluded. It is important that the room be sufficiently large to permit the ready entrance of persons for operation and maintenance work. In general, combustible rooms lined with sheet metal, asbestos, or similar materials are not suitable, for they are rarely sufficiently fire retardant or dust excluding. It is often feasible to make provision for such a room to contain, not only the service and circuit protection apparatus, but also the motor controllers as well, especially those of the remote control type.

In the larger plants, especially the larger grain elevators and flour mills, it is often necessary to provide sub-feeder distribution panels in certain portions of the plant in order to obtain a more economical and convenient installation. This can readily be provided by building rooms of the style previously suggested at or near the load centers and locating the panelboards in them.

However, where space does not permit the construction of a special

room, and it is necessary to install service or circuit protection apparatus within the hazardous area, such apparatus must then be enclosed in dust-tight cases. It is probable that the need for resorting to this solution will apply to panelboards only. There are available dust-tight panelboards that employ circuit breakers which permit resetting of the breakers without opening the case, a valuable safety feature.

### Fuses and Circuit Breakers

As in the case of service and circuit protection equipment, every effort should be made to locate fuses and circuit breakers in non-hazardous areas or in fire-resistive rooms of the type described. However, in installations of the older type, and possibly in isolated cases in new construction, it may be found necessary to locate them within the hazardous area. In such an event, the rules require that fuses be enclosed in dust-tight metal cabinets or cases and that circuit breakers be of the dust-tight or dust-tight oil immersed type. Fuses and their dust-tight enclosures should be inspected and tested as a

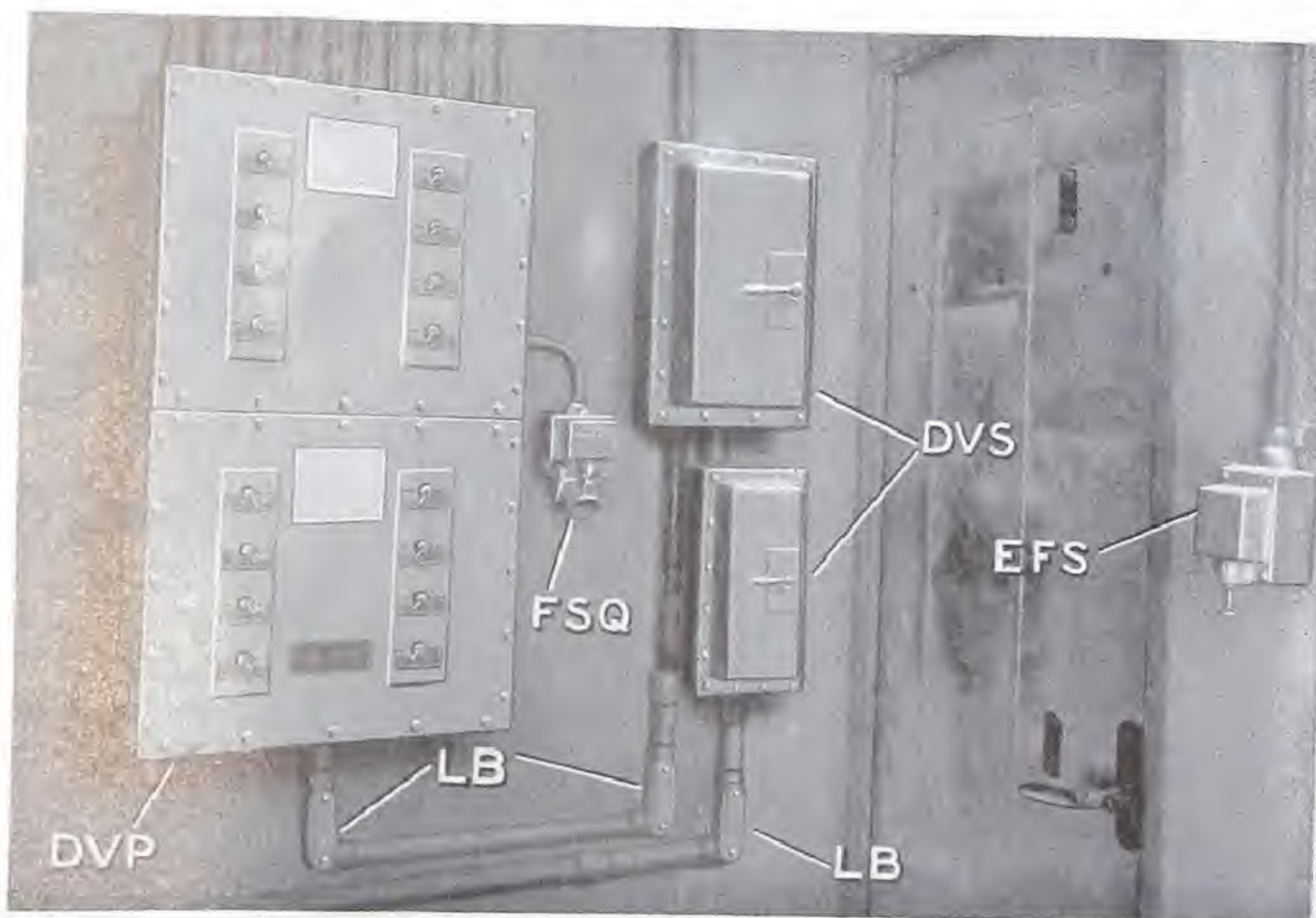


Type DVS  
Dust-Tight Circuit Breaker Condulet

complete assembly, principally because there is a definite relationship between the capacity of fuses, their enclosures, and the resultant temperature rise. Owing to the fact that it is necessary to open the cabinet or case to replace fuses and that it is practicable to design circuit breakers which may be reset without opening the enclosing case, the latter are to be preferred.

### Motors and Generators

In the selection of motors for installation in Class II locations there are several requirements which should receive consideration. First of all, for any motor having brushes or other sliding contacts, certain safeguards must be provided to insure against the ignition of the dust and air mixture by sparks or arcs which might occur at the brushes or other



Dust-Tight Panelboard, Circuit Breakers, Switch, Plug Receptacle, and Other Condulets in Grain Elevator



sliding contacts. This safeguarding may be accomplished in any of several ways, as follows:

1. Enclose the brushes or sliding contacts in substantial dust-tight housings.

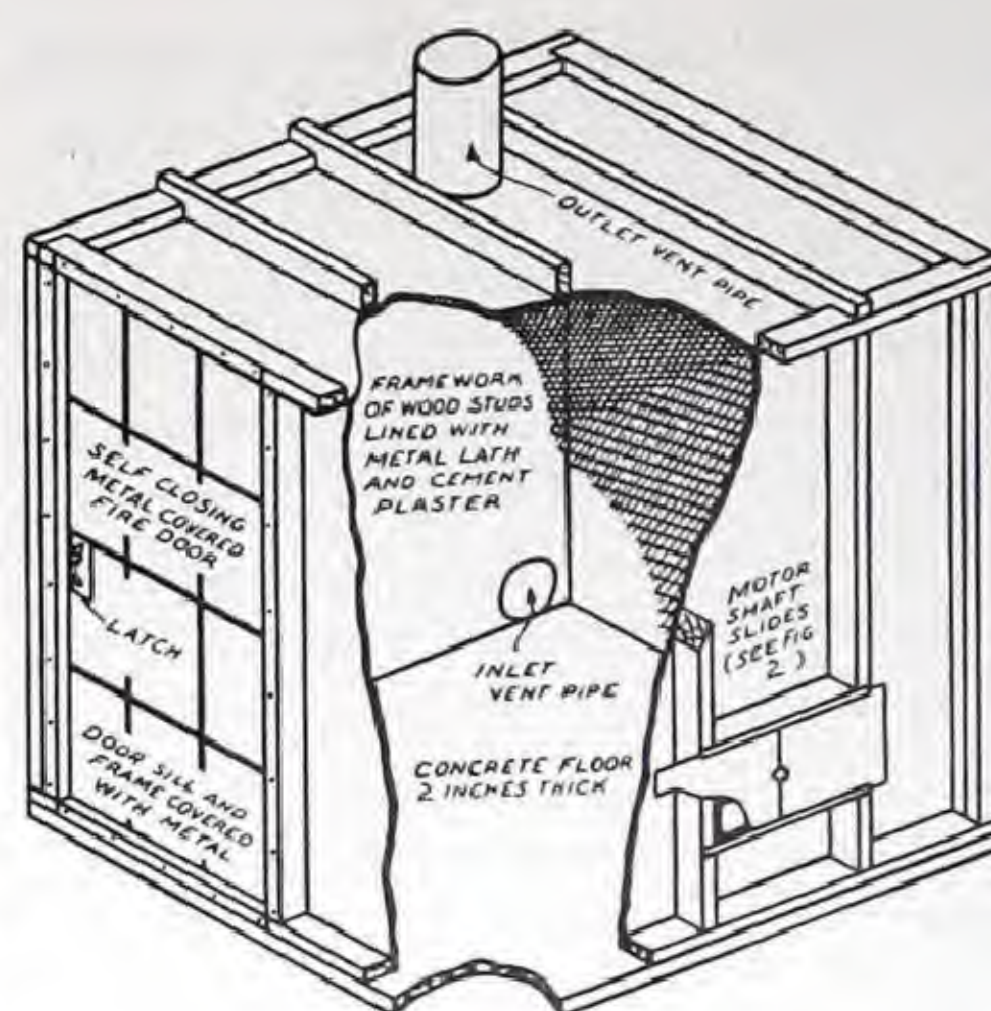
2. Select a motor of the totally-enclosed, totally-enclosed fan-cooled, or totally-enclosed pipe-ventilated type.

3. Enclose the motor in a separate room or enclosure built of or lined with substantial non-combustible materials and so constructed as to adequately exclude dust. The room or enclosure must be ventilated from a source of clean air so that excessive temperature rise of the motor will be prevented.

4. Install the motor in a non-hazardous location, such as a power house definitely cut off from the hazardous area.

Of these methods, the latter three are greatly to be preferred for they give protection, not only against ignition by sparks from the brushes or slip rings, but also against ignition by burnout of the windings of the motor. Furthermore, the windings of the motor are protected against accumulations of dust which, if permitted, would contribute to the possibility of insulation breakdown.

Where it is impossible to prevent combustible dust from collecting on or in the motors in such quantities as to prevent proper radiation of heat, such motors, whether or not having brushes or sliding contacts, must be of the type, or installed as specified, in paragraphs 2, 3, or 4 above. Such conditions are often found in the basements, tunnels, and cupolas of grain elevators, the cleaning departments of flour mills, and in corresponding locations in feed mills. Also, a like situation often exists in sugar, spice, cocoa, wood, hard rubber, and coal pulverizing rooms. Necessarily, good housekeeping, efficient dust control systems, and regular maintenance are valuable factors in preventing the accumulation of



dust on or in motors, but a change in ownership or management may bring about a decided reduction in the value of these factors. Therefore, it is recommended that the trend be toward safety in all instances through employment of the enclosed type of motors or enclosure in rooms of the type previously mentioned.

The code recognizes three types of enclosed motors. The totally-enclosed type is usually found only in the small sizes, that is, up to 2 h.p. For a time the pipe-ventilated type was extensively used, but it has now been superseded by the totally-enclosed fan-cooled type, with the possible exception of the large sizes of 75 h.p. and upwards.

The construction of suitable rooms or enclosures for motors is similar to that described previously under "Service Equipment" except that it is necessary to provide for the protection of the motor shaft opening through the wall and to furnish means for ventilation to prevent excessive rise in temperature. The details of the construction of such an enclosure are given above, and from these it will be seen that the enclosure is of sufficient size to permit the entrance of a person to do necessary maintenance work. Such an enclosure is suitable for installation in brick or frame buildings, but if the building is of fire-resistive construction, the enclosure should be equally fire resistive. Rooms or enclosures

lined with asbestos, metal, or similar materials are not to be recommended as they are not sufficiently fire retardant. Small metal or wooden boxes just large enough to house the motor should be prohibited as they prevent cleaning and maintenance work on the motor, and in most cases are a detriment rather than a help.

The vent pipes used in connection with pipe-ventilated motors and with motor rooms or enclosures must be of metal and with successive lengths riveted or welded together and leading to a source of clean air outside of the building. The outer ends must be screened to prevent the entrance of animals or birds whose nests would obstruct the flow of air. The ventilation necessary for rooms or enclosures should be computed carefully for each installation. Generally, for motors up to 25 h.p., natural ventilation will be found satisfactory, but for larger motors an auxiliary exhaust fan may be necessary.

Generators installed in Class II locations are subject to the same comment as the foregoing applying to motors. However, in most instances it is convenient to install generators in a power house or other non-hazardous location, permitting the use of ordinary open type machines.

### Motor Controllers, Overload Protective Devices, Switches, and Resistance Devices

For the same reasons as discussed for service equipment motor controllers, switches, and auxiliary apparatus, if within the hazardous area are required to be enclosed in suitable fire-resistive rooms, in dust tight cabinets or cases, or be of the dust-tight type, or dust-tight or immersed type; and further, be so designed that the device, except when in rooms, may be operated without opening the cabinet or case.

It is preferable when practicable to isolate the apparatus from the



hazardous area by installing it in a power house or similar dust free location. With this type of construction the motors may be conveniently controlled from push button stations, which, if in the hazardous area, are required to be of the oil immersed or dust-tight type.

### Heating Appliances

Any heating appliance intended for use in a Class II location must be specially approved. Occasionally it is desired to use electric heaters in certain locations in flour mills and grain elevators. Usually these rooms are reasonably free from dust, as a weighmaster's or foreman's office, a laboratory, or a locker room. In such instances any approved electric heater installed with reasonable care should be permitted. When the room cannot be so cut off as to prevent the entrance of appreciable amounts of dust, the heater should be of a specially approved type. It is probable that an immersion or low temperature strip heater will be developed for this purpose.

### Lighting Installations

The requirements of the rules for lighting installations in Class II locations are practically identical with those for Class I locations, so it is



Dust-Tight Lighting Fixtures and Other Condulets in Sugar Refinery

unnecessary to repeat the discussion given in the previous chapter. However, it should be borne in mind that dust-tight, rather than explosion-proof, equipment is required in Class II locations.

Also, the rules for Class II locations permit pendent lights supported by flexible cords whereas the Class I rules do not. Heavy fixtures, however, are required to be supported to conduit hangers or chains to prevent undue strain on the wires.

It should be emphasized that portable lights be eliminated so far as possible for they are dangerous even at their best. The unenclosed and unguarded incandescent lamp, whether portable or fixed, is a distinct hazard, as the breakage of such a lamp is an almost unfailing source of ignition. Further, it has been found that an accumulation of grain dust on a bare 60-watt lamp was ignited in seven minutes. Records show that fires have resulted from this very cause.

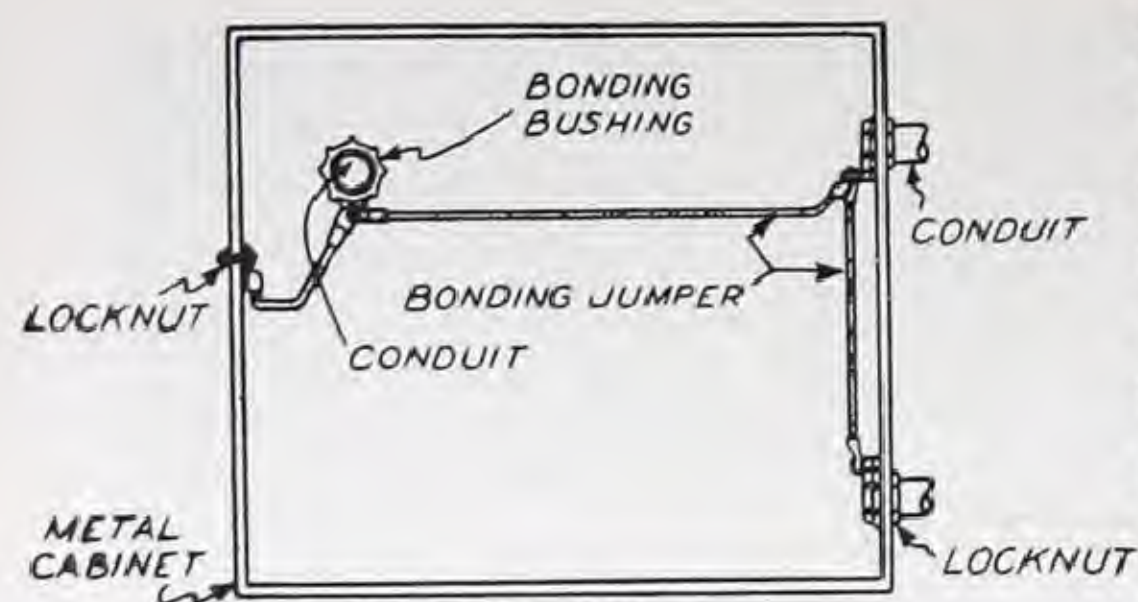
### Grounding

The permanent and effective grounding of the non-current-carrying parts of all equipment is very important. To provide for a reliable grounding circuit, provisions additional to those in Article 250 of the code are included. Dependence is not to be placed on the locknut and bushing type of contact. If these are used at junction boxes, auxiliary gutters, or other points, it is required that bonding jumpers be installed to provide a permanent low resistance grounding circuit. Such bonding jumpers are not required where threaded connections are used. It



Type DLA Dust-Tight Lighting Fixture





Illustrating the Use of Bonding Bushings and Jumpers

is recommended that a wire bond be installed around flexible steel conduit when the material is used at motor terminals, so that there will be a positive circuit from the motor frame to the rigid conduit without depending on the flexible conduit connectors or flexible conduit. The bonding jumpers should be used up

to and including the point where connection is made to the water pipe or other grounding electrode. Special attention should be given to the matter of securing a good ground and to the installation of the grounding conductor and its connection. The diagram illustrates the use of bonding jumpers.



## CHAPTER V

### Classes III and IV Hazardous Locations

**I**N THE rules of Article 500 for Class III and Class IV locations we are dealing with locations where easily ignitable fibers or materials producing combustible flyings are present. In Class III have been placed those locations where such materials are manufactured or used, in other words, locations involving manufacturing or processing operations. Because Class III and Class IV locations involve similar hazards, thus requiring identical treatment in type of equipment and its installation, the rules for these classes have been grouped in a single division of Article 500. It will be found that some special rules apply to one class or the other but, as this is clearly set forth in the rules involved, no confusion should result.

Easily ignitable combustible fibers have proved to be decidedly hazardous materials due to the ease of ignition and the speed at which flames spread through them. When a fibrous material, such as cotton, is distributed in the form of lint or "flyings" in a thin film over machinery and building members, a fire proceeds with almost explosive rapidity through the entire room. Such fires are usually called "flash fires" and have been the origin of tremendous disasters.

When fibers are compressed into bales and wrapped with burlap the apparent hazard would seem to be reduced. However, in baled storage

there is usually sufficient loose lint protruding from the bales to permit travel of fire over the surface with amazing speed. Very often smoldering fires remain in individual bales after the primary flash fire, and these are difficult to extinguish. Many serious fires have occurred in large terminal cotton warehouses, especially in those of less modern construction, where the warehouses are of several acres in extent without fire cut-off partitions. Large property values are usually present which makes the prevention of fire, including special care in the selection and installation of electrical equipment, decidedly important.

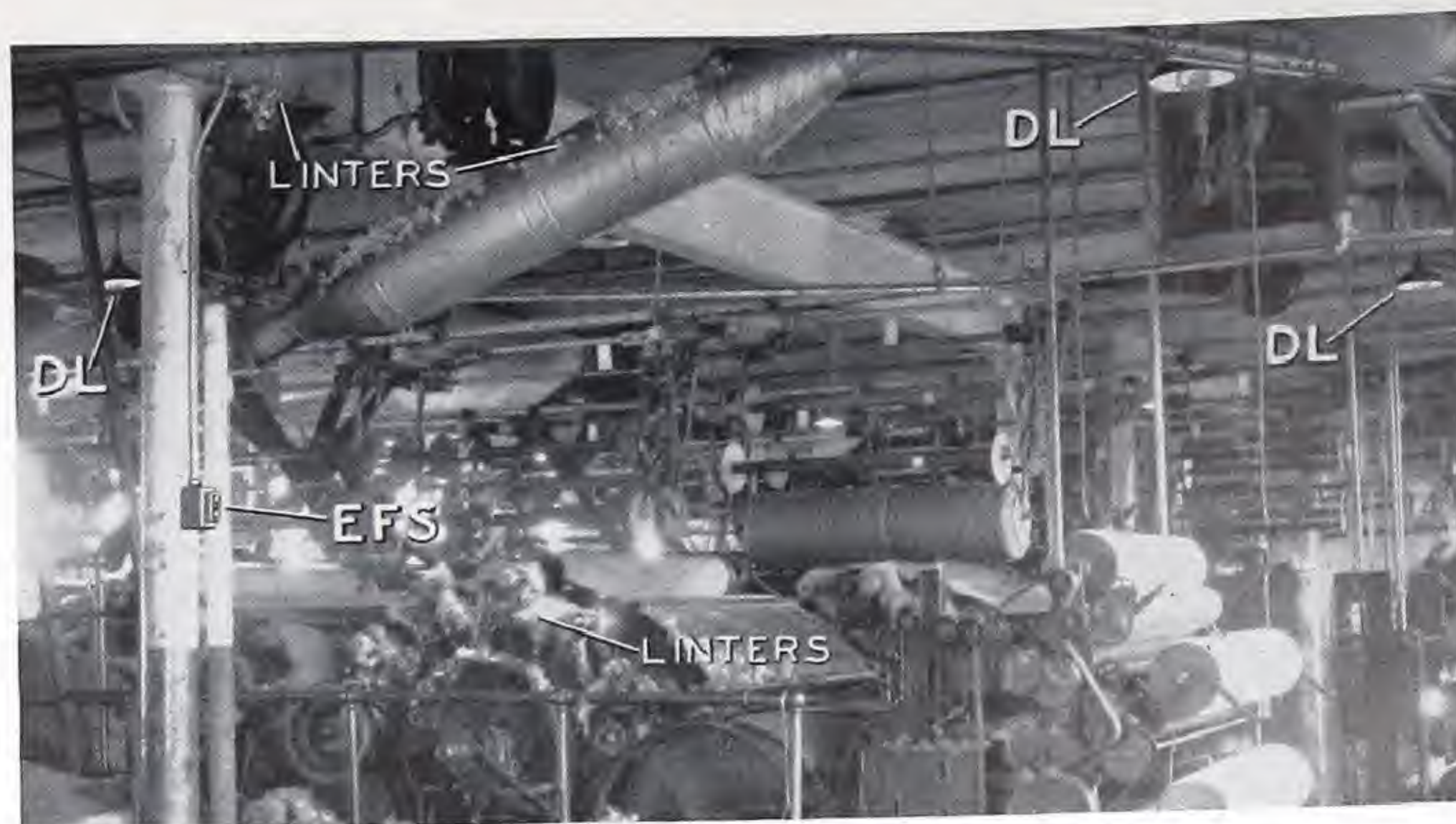
In manufacturing operations involving combustible fibers, such as in the opening and picking departments of cotton mills, in mattress factories, and in upholstery establishments, the primary hazard is somewhat increased because the materials are handled in light, loose form offering ample surface for ignition and combustion. However, the amount of material present and exposed is usually considerably less than in terminal warehouses and therefore the actual property loss is somewhat smaller.

In either case it should be kept in mind that these combustible fibers may be easily ignited by electric arcs or sparks, by the heated filament



Dust-Tight Lighting Fixture, Switch, and Other Condulets in Cotton Mill





Dust-Tight Lighting Fixtures and Switch in a Textile Plant

from a broken incandescent lamp, or even by the heat from an unenclosed lamp or resistor.

Of the easily ignitable combustible fibers encountered in commerce, the following are representative:

- Cotton
- Sisal or Henequen
- Coco fiber or Coir
- Tow
- Ixtle or Istle
- Excelsior
- Jute
- Spanish Moss
- Oakum
- Kapok
- Cotton Waste and Linters
- Hemp

Under some conditions of poor housekeeping or inadequate waste disposal methods, it may be necessary to include in this class combustible, light materials such as paper cuttings, wood shavings, and coated papers. These, while comparatively easily ignitable, are not to be considered as hazardous as the fibers listed above because the production of lint and "flyings" is not involved. Animal fibers, such as wool and silk, are not usually regarded as of the easily ignitable class.

### Typical Locations

As in the classes previously discussed, the presence and extent of the hazardous areas depend to a large extent on the arrangement of buildings, the method of handling the fibers, the type of machinery, and the degree of housekeeping main-

tained. However, in the following an attempt will be made to name the more common Class III and Class IV locations with the added warning that each particular plant be judged somewhat on its own merits.

**Cotton Gins.** The Class III hazardous areas are represented by the seed cotton house, the gin building, the cleaning building, if any, and the cotton seed houses. Buildings such as the power house, office, and shop buildings are exempt.

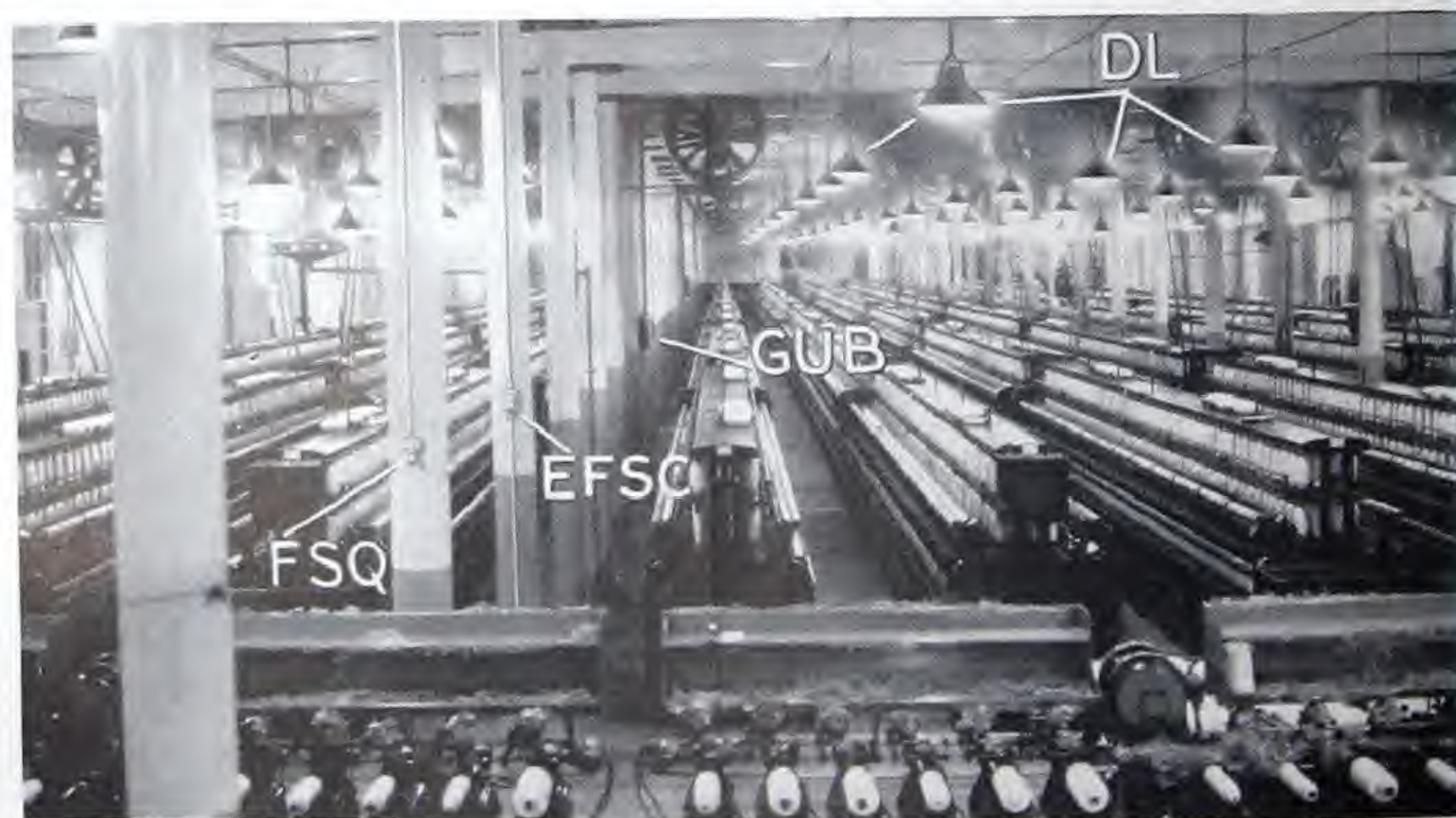
**Cotton Compresses.** Establishments of this type are commonly associated with cotton warehouses and therefore are usually required to be regarded as Class IV locations.

**Cotton Mills.** In this general class

are placed mills producing cloth, bagging, hosiery, and similar goods. As a rule, the hazards involved diminish as the process proceeds from the raw materials to the finished goods. The opener room where the bales of cotton are opened, the picker room, the carding room, the dust bins, and the cotton compartments or bins are to be regarded as Class III locations. In some types of processes where excessive quantities of flyings are produced, the hazardous area may extend into the spinning and weaving departments, especially in the vicinity of machines. In the case of the larger mills where considerable baled cotton may be stored in warehouses, such warehouses should be considered as Class IV locations.

**Cotton Seed Oil Mills.** The hazardous areas in this type of plant include the seed house, the seed cleaning and delinting rooms, and the linter baling department. These should be regarded as Class III locations. If the linter storage is of any considerable extent, this department should be regarded as a Class IV location; but if the amount stored is small, it is permissible to regard it as a Class III location.

**Upholstery Establishments.** These may represent departments in furniture factories, automobile works



Dust-Tight Lighting Fixtures, Switches, and Plug Receptacles in Textile Plant



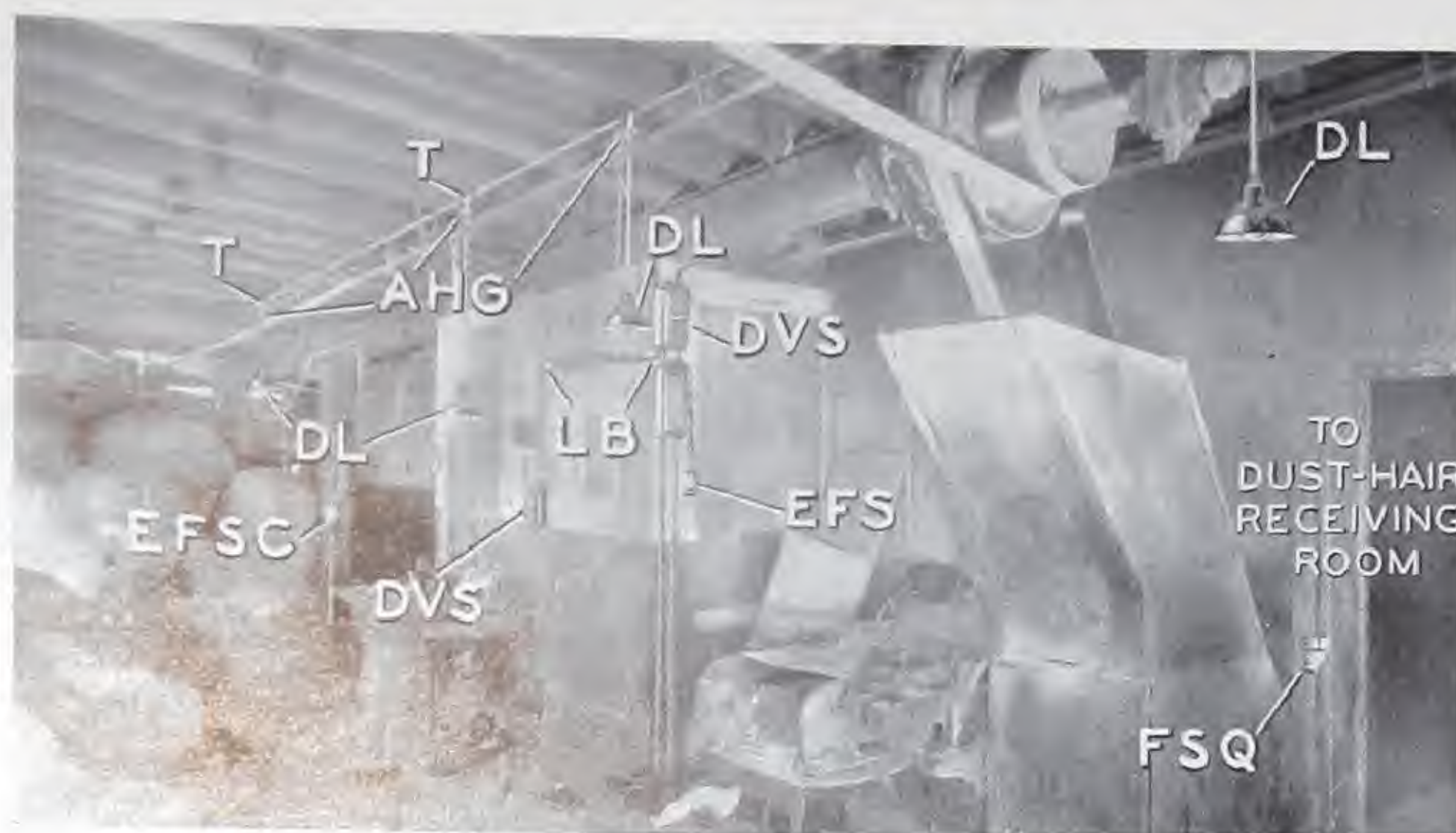
casket factories, and others where a considerable volume of upholstery work is done. Generally, the Class III hazardous area includes the opener and picker room and the immediate area about the points where the material is handled in loose form. The fiber storage rooms should be regarded as Class III or Class IV locations depending on the amount stored.

**Mattress Factories.** Establishments of this type involve the handling of loose cotton or other combustible fibers and as a result all parts of the plant up to the point where the ticking is sewed should be regarded as Class III locations.

**Combustible Fiber Warehouses.** The Class IV hazardous area extends throughout, including covered loading docks and runways. Cut-off sections used for non-hazardous purposes such as offices, shops, and similar areas are exempt. Warehouses of this class may be of the terminal type or may be associated with cotton mills, artificial silk factories, pyroxylin, and explosives factories, and others where large quantities of fibers are stored.

### Apparatus

The rules for both Class III and



Lighting Fixtures, Switches, and Other Dust-Tight Condulets in Mattress Plant

Class IV locations have the common purpose of prescribing types of apparatus and wiring which will, first, prevent the ignition of lint and similar materials by arcs or sparks occurring in their immediate vicinity, and second, will guard against the ignition of such substances through overheating of apparatus such as lamps, motors, and the like because of accumulations of lint on or in them.

It will be found that the rules for both classes require, in general, that the cases enclosing arcing contacts, lamps, and similar apparatus be dust-tight, although the materials involved are usually of a linty nature.

It was felt that this requirement was necessary because there is a considerable variation in the degree of fineness of the lints, some approaching that of a dust. It has been found that the ordinary so-called "dust-proof" enclosures or cases were not sufficiently tight to adequately exclude lint, especially in the more hazardous locations. Furthermore, these comparatively lightly built enclosures cannot be depended upon to retain sparks or heated metal which might occur even in normal operation.

Underwriters' Laboratories, Inc. has not drawn standards for apparatus intended specifically for Class III or Class IV locations, it being felt that equipment listed for Class II locations was suitable. This stand is concurred in by electrical manufacturers and by the Article 500 Committee and is generally accepted by inspection authorities.

The rules for Class IV locations are somewhat more stringent than those for Class III. This is partly because of the large values and extensive areas involved in the former and partly for the reason that any small spark or heated metal may ignite the lint protruding from the bales. In passing, it might be well to call attention to the fact that the Class IV rules have the approval of



Lighting Fixtures, Switches, and Other Dust-Tight Condulets in Mattress Plant



the National Fire Protection Association Committee on Combustible Fiber Storage and therefore uniform enforcement may be expected.

With this introduction we may now proceed to discuss the intent and application of the specific rules for the two classes. Reference will be made frequently to the discussion of the rules for Class II locations which appear in the preceding chapter. This is done to avoid unnecessary repetition.

### **Type of Wiring**

For the same reasons as cited in our discussion of the type of wiring for Class II locations, it is required that all wiring in Class III locations and in any sections of Class IV locations where compresses or other machinery is located be in rigid conduit having threaded joints. The installation of open wiring on insulators in those sections of Class IV locations used solely for storage purposes is permissible. However, where such open wiring is installed, it is required that the wiring be run in roof spaces well out of reach of sources of mechanical injury, or that guard strips or running boards, as provided in Section 3212 of the Code, be employed to protect the wiring from mechanical injury. When conduit wiring is used, the locknut and bushing form of attachment to boxes and cabinets may be used provided bonding jumpers are installed to effectively bond together all runs of conduit so attached.

Where the storage room or compartment form of warehouse construction is involved, it is recommended that pilot lights be installed outside of such rooms or compartments to indicate when the current in the room is "on" or "off."

### **Transformers and Capacitors**

In all instances it is to be recommended that transformers and capacitors be located outside the building proper, in such a manner that

they and their combustible supports are at least ten feet horizontally from any exposed combustible parts or unprotected openings of buildings. In some cases, however, it may be necessary to locate transformers and capacitors within buildings, requiring that they be suitably enclosed or safeguarded. The Class III and Class IV rules on this point are identical with those for Class II locations which have been previously discussed.

### **Service Equipment, Panelboards, and Switchboards**

The requirements for this type of apparatus are identical with those for Class II locations, so detailed comment will not be needed at this point. It should be emphasized, however, that every effort be made to locate the service equipment and distribution centers outside of the hazardous areas. This can usually be done more readily in the case of lint than when dust is involved, because lint does not have such a marked tendency to diffuse through an area.

Fuses and circuit breakers should be located outside of the hazardous area whenever practicable. When this cannot be conveniently done they are required to be installed in the manner detailed under the same subject in the discussion of the rules for Class II locations.

### **Motors and Generators**

For Class III locations, motors having brushes or sliding contacts shall: (1) be totally-enclosed fan-cooled, or totally-enclosed pipe-ventilated, or (2) be enclosed in separate rooms or housings, or (3) have brushes or sliding contacts enclosed in substantial tight metal housings.

The separate rooms or housings referred to in the foregoing relate to motor enclosures of the type described in our discussion on the rules for Class II locations. Of the alter-

natives mentioned, the first should always be given preference as this provides for the guarding of the entire motor.

In certain Class III locations where lint and flyings may be present in excessive quantities, such as in some cotton gins or in the seed cleaning and linter rooms of cotton seed oil mills, it is required that the motors be of one of the totally-enclosed types or be located in a separate fire-retardant room or enclosure. In reasonably clean locations of the Class III designation, open squirrel-cage motors may be used but the enclosed types are always to be recommended.

The rules for Class IV locations definitely require that all motors, regardless of type, be of one of the totally-enclosed types or be located in a separate fire-retardant room. This means that even motors on cranes, electric trucks, and similar equipment must be so designed or guarded.

Obviously, motors placed in power houses or similar non-hazardous locations are subject only to the general provisions of the Code as given in Article 430.

Generators installed in Class III and Class IV locations are subject to the same comment as the foregoing applying to motors. However, in most instances it will be found convenient to install generators in a power house or other non-hazardous location, thus permitting the use of ordinary open type machines.

### **Motor Controllers, Protective Devices, Switches, and Resistors**

Motor controllers, overload protective devices, switches, and resistance devices should, whenever practicable, be located in a fire-resistant room or in a non-hazardous location. In general, the same comments as given in our discussion of Class II rules apply. For resistance devices it is required that, in addition to



being enclosed in dust-tight cases, the cases be so designed as to prevent ignition of lint or flyings by direct contact with the case, whether the device is in normal operation or in event of accident. This may be accomplished by providing a second enclosing case over the first, thus reducing surface temperatures.

### Heating Appliances

Heating appliances are required to be of a type approved for installation in locations where combustible flyings or lint are present. Normally, heating is not required in the hazardous area itself except in the case of manufacturing plants. In the majority of such instances steam or hot air heat is available, thus making the use of electrical heating appliances unnecessary.

### Lighting Equipment

In locations where there is a possibility of lint or flyings collecting on lamps in fixed positions, it is important that the lamps and lampholders be enclosed in dust-tight fixtures so designed that in event of the burn-out of the lamp or lampholder no spark or hot metal can escape from the enclosure. This is especially important in combustible fiber storage warehouses where a spark or hot metal from a lamp or its holder can drop to stored fiber below and cause a serious flash fire. When such lamps are exposed to mechanical injury, additional protection is required in the form of substantial metal or other approved types of guards. Only lampholders of the keyless type are permitted by the rules and these are required to be wired with not less than No. 14 gauge wire and in such a manner that no conductors will be exposed. Unless supported by and supplied through hangers of rigid conduit or other metal tubing of equivalent thickness,

lamps of the pendent type may not be installed.

Fixed lamps may be in receptacles attached directly to outlet boxes but in no case are they to be installed where they are likely to be injured when bales are tiered or handled. To obtain some protection from such injury, lamps should be installed between beams rather than on them.

The use of portable lamps should be discouraged for they are hazardous even at their best. When they must be used they are required to be of the dust-tight guarded type. Cords for portable lights and other portable appliances and the plugs and receptacles used with them are identical with those specified for Class II locations.

### Electric Cranes

The rules for Class III and Class IV locations contain requirements regarding the safeguarding of cranes and their auxiliaries. These are important because sparks dropping from the collectors of a trolley type crane to baled cotton below may cause a disastrous fire. When cranes are of the trolley type they must be operated on an ungrounded system in order that accidental grounds in windings or circuits may be detected without delay. Such detection of accidental grounds is then possible by use of a recording ground detector in the feeder circuit, operating in conjunction with a relay which automatically causes the opening of the feeder circuit breaker should the insulation resistance of the system fall below 1000 ohms. A protective system of this type is operating satisfactorily in a large terminal cotton warehouse in New Orleans. By occasionally inspecting the tape of the recorder the operator can detect any decrease in insulation resistance and very easily make the necessary repairs before serious trouble occurs.

More than usual care should be taken in the design of moving current collectors of the crane in order to reduce sparking and, as further precaution, non-combustible barriers must be provided under the collectors to prevent the escape of sparks or hot particles.

Where the crane travels a comparatively short distance, it is often practicable to supply current to the crane through a flexible cable equipped with an approved reel or take-up device. Cables used with cranes of this kind shall be Type S.

### Battery Charging Equipment

In cotton warehouses storage battery trucks are often used, thus necessitating equipment for charging their batteries. This equipment is required to be located in an outside building of non-hazardous occupancy or in a separate fire-resistant room in the warehouse, so built as to exclude flyings or lint. This room must be well ventilated to permit the escape of gases generated during the charging process. Placing or removing batteries in or from trucks must be done only in this room and not in the warehouse proper.

### Grounding

The grounding of the non-current-carrying parts of equipment in Class III and Class IV locations is as important as in other hazardous locations. This must be done in a permanent and effectual manner and therefore close adherence to the rules is advised. Dependence on the lock-nut and bushing type of contact is not permitted, bonding jumpers or other approved means being required to insure an effective and permanent grounding circuit. Reference should be made to the discussion of this subject under the rules for Class II locations.



## CHAPTER VI

### Questions and Answers

**I**N THIS concluding chapter a number of the most frequently asked questions pertaining to the application of Article 500 will be answered. It must be realized that some of the questions, particularly those concerning the existence and extent of a hazardous area, must be answered in a more or less general manner. However, it is hoped that the answers given will prove sufficiently definite to be of assistance.

*How can one determine whether or not a motor, controller, lighting unit, or other piece of apparatus intended for installation in a hazardous location is approved?*

In general, inspection authorities regard the label of Underwriters' Laboratories, Inc. on electrical devices evidence that such devices are worthy of approval. Devices listed for hazardous locations will be found to carry labels stating the class and group for which the particular device has been tested and found suitable. For instance, a label carrying the legend, "Listed for Hazardous Locations, Class I, Group D" signifies that the device is worthy of approval for use in atmospheres containing gasoline vapor and vapors or gases of equivalent hazard.

*Who is to judge whether a certain premise is a hazardous location?*

The authority enforcing the Code is charged with the duty of judging whether or not the hazardous conditions defined in the first section of

Article 500 are present in a given premise. Owing to the wide variety of types of hazardous industries and processes and the varying conditions present in each, it would obviously be impracticable to include in Article 500 specific rules naming each industry and process and the probable extent of the hazardous area.

*Outside of his own opinion, how can an inspector determine whether vapors or dust are present in dangerous quantities?*

Actually, the inspector should regard the presence of any amount of vapor, gas, dust, or lint sufficient grounds for placing the particular premises involved in the hazardous class. This is especially true where natural or artificial ventilating systems are depended upon for the removal of vapors, gases, or dusts, as the failure of ventilating systems, changes in wind velocity or humidity, and other factors may render a relatively safe location decidedly hazardous. In other words, the inspector should lean towards safety rather than place too much confidence in the maintenance of proper ventilation, housekeeping, and general upkeep.

*In an automobile repair shop where pyroxylin spray painting is done, how far from the spray booth should the hazardous area be considered to extend?*

The extent of the hazardous area surrounding a spray booth is a mat-

ter subject to the judgment of the inspection authority. In some jurisdictions, however, the hazardous area has been arbitrarily assumed to extend to a distance of 25 feet from the booth. With booths of modern design and with proper ventilation this assumption can be safely made. When less modern or no booths are used and when adequacy of ventilation is questionable, the inspector is justified in extending this area.

*Are garages to be considered as hazardous locations and be made subject to the rules of Article 500?*

Garages are not intended to be regarded as coming under the rules of Article 500. Rules for electrical wiring and apparatus in garages will be found in Article 510.

*In the definition of Class II locations, why is a distinction made between those locations where dust is likely to be in suspension in the air in sufficient quantities to form an explosive mixture and those locations where it is impracticable to prevent accumulations of dust in such quantities as to prevent proper radiation of heat from motors and other devices?*

In modern flour mills, feed mills and grain elevators having complete dust control systems, excessive accumulations of dust are unlikely and yet there may be sufficient dust in suspension in the air to form an explosive mixture. Under such conditions, the rules permit the installation of open squirrel-cage motor



(non-sparking type) and yet require protection against the presence of sparks or arcs which might occur during normal operation, such as at motor brushes, contactors, etc. In plants not having such dust control systems, it is a difficult matter, at least in some locations, to prevent the accumulation of dust in quantities sufficient to prevent normal radiation of heat. In any event, the inspector should assume conditions at their worst, for changes in management or supervision, or failure of the dust control system may render a normally clean plant excessively dusty.

*Is a liquor distillery to be considered a hazardous location? If so, what departments are to be so considered and in what class should each be placed?*

There are several locations in liquor distilleries which are subject to classification as hazardous locations. Among the possible Class I locations are the still and column rooms, the sight box room, the cistern room, and probably the rack house. The grain elevator, the mill or grinding department, and the feed department where the spent grain is dried and packed should be considered as Class II locations. The hazards of distilleries vary with the "proof" of spirits manufactured or handled. Many, if not most distilleries, now produce 190 proof spirits for blending purposes and as this is almost absolute ethyl alcohol, the hazards are obvious. There seems to be a wide variance of opinions regarding the degree of protection needed in distilleries but owing to the very high values involved, especially in the rack houses, it would seem desirable to insist on the highest grade apparatus and wiring in all locations where there is any likelihood of alcohol vapors being present.

*Are wool and silk to be considered combustible fibers?*

Wool and silk are generally not easily ignitable and when ignited do not burn rapidly. For these reasons

they are not considered combustible fibers within the meaning of Article 500.

*At what points do the rules for Class I locations require sealing? Is such sealing required by the rules for Class II locations? If not, why not?*

The rules for Class I locations require that conduit be sealed off at motor terminals, controller and switch cases, lighting units, and other similar points where arcing or sparking is likely to occur. They also require that when a run of conduit extends from a hazardous to a non-hazardous location, the conduit be sealed off at the division point between the two locations. Attention is directed to the discussion and illustration on this question which appears on pages 15 and 16 in Chapter III. Such sealing is not required in Class II locations for the reason that the diffusion of dust through a conduit system would be negligible.

*Are sealing compounds of suitable type readily available?*

Several manufacturers in submitting sealing fittings to Underwriters' Laboratories, Inc. included suitable compounds to be used with the fittings. These compounds may be purchased directly from the manufacturers.

*Are threadless fittings permitted in Class I locations?*

The rules for Class I locations specify that joints in conduit and fittings used with it be explosion-proof. So far, an explosion-proof threadless coupling or fitting has not appeared. Ordinary threadless fittings are not approved for use in Class I locations.

*Why is it not permissible to install electrical equipment such as lighting fixtures and motors in pyroxylin spray booths, if such equipment is of the explosion-proof type?*

In spraying articles with pyroxylin spray, a fine dust residue of a highly combustible nature is deposited within the booth. This residue has been known to break down and ignite

at temperatures as low as 212° F. or at temperatures much below those attained by the exteriors of enclosed lighting fixtures or the frames of overloaded motors, hence the need for excluding all electrical apparatus from spray booth interiors.

*Is a motor listed by Underwriters' Laboratories, Inc. for Class I locations permissible for installation in Class II locations?*

A Class I motor is not necessarily dust-tight and therefore should not be accepted for Class II locations unless a dual listing for both Class I and Class II has been obtained.

*May an open squirrel-cage motor be installed in a flour mill? An open wound rotor motor having unenclosed slip rings?*

The rules for Class II locations permit the installation of open squirrel-cage motors (non-sparking type) in those locations in a flour mill where the inspector is assured that accumulations of dust in the motor will not be sufficient to prevent proper radiation of heat. A wound rotor motor with unenclosed slip rings is not permitted to be installed in the flour mill proper unless within a separate motor room of proper construction. The rules recommend that all motors, regardless of type, be of the enclosed type or be enclosed in standard motor rooms as described in the fourth chapter.

*Do the rules for Class II locations apply to cement plants? If not, does the Code provide for the protection of motors in such plants against dangerous accumulations of dust?*

The rules for Class II in Article 500 do not apply to electrical installations in cement plants inasmuch as cement is not a combustible dust. Where motors in such plants are subject to excessive accumulations of dust, the protection of the motors is provided for in Section 4303 of Article 430. This prescribes safeguards identical with those in the rules for Class II.



*Is it required that all fixed lighting units in Class II locations be protected by guards?*

When installed in Class II locations only those fixed lighting units exposed to mechanical injury are required to be equipped with guards in addition to the dust-tight outer globes. While this matter is left to the judgment of the authority enforcing the Code, guards should be required on all lighting fixtures with the exception of those which may be mounted on high ceilings well out of reach.

*Does the term "vaporproof" have any significance as applied to lighting fixtures for use in Class I locations?*

The term "vaporproof," while not now defined in Article 100 of the Code, was a term originally applied to lighting fixtures, etc., intended for use in damp or wet locations such as boiler houses, pump houses, out of doors, and similar places. The term has no significance as applied to lighting fixtures for Class I locations as the so-called "vaporproof" fixtures are by no means "explosion-proof."

*Are running threads permitted for connecting runs of conduit in Class I locations?*

Because running threads must be tapered and cut rather deeply, connections using them will usually not be found to be explosion-proof and therefore they should not be permitted. There are available explosion-proof unions which makes it possible to effect connections in conduit without resorting to running threads.

*Are lighting fixtures within gasoline pumps, such as those used for illuminating the dials, required to be of the explosion-proof type? The dome lights?*

Inasmuch as the interior of a gasoline pump is considered a Class I location, lighting fixtures within it are required to be of the explosion-proof type. However, the standards of

Underwriters' Laboratories, Inc. do not yet require lights such as those used for illuminating dials to be of the explosion-proof type, but it is thought that this will be a requirement in the near future. Dome lights may be of the ordinary type but the lower portion should be sealed off from the pedestal interior to prevent accumulation of vapor within the globe and to prevent sparks or heated metal from falling into the pedestal in event of breakage.

*Is it necessary to provide a bonding jumper from the frame of a motor in a Class II location to the rigid conduit when a short length of flexible steel conduit is used at the motor terminals?*

As ordinarily installed, flexible steel conduit at motor terminals is attached to the terminal box by means of a locknut and bushing and to the rigid conduit by means of a clamping device. Under such conditions, the rules (Article 500, Class II locations) require a bonding jumper from the frame of the motor to the rigid conduit.

*Are fittings, such as "ells," junction or pull boxes, and similar enclosures, required to be of the dust-tight type when used in Class II locations?*

The rules for Class II locations do not require that fittings, junction boxes, pull boxes, and similar enclosures be dust-tight unless the dusts are electrically conductive, or unless the enclosures contain arcing or sparking contacts, or devices which tend to create high temperatures while in normal operation.

*Is specially listed equipment available for Class III and Class IV locations?*

Underwriters' Laboratories, Inc. does not list equipment specially for Class III and Class IV locations. Inasmuch as the rules for these classes specify dust-tight equipment, it was felt that Class II equipment was satisfactory for use in the type of

locations described in Class III and Class IV.

*Are motors installed in Class III locations required to be of the enclosed type or be enclosed?*

In Class III locations any motor having brushes or sliding contacts (a sparking motor) is required to (1) be of the enclosed type, or (2) be enclosed in a standard motor room, or (3) have such brushes or sliding contacts enclosed in substantial dust-tight housings. Motors of the squirrel-cage type or others not having brushes or sliding contacts may be installed without enclosures unless such motors are located in a place where they will be subject to dangerous accumulations of lint, such as in cotton gins, and in the cleaning and linter rooms of cotton seed oil mills. In the latter case, the motors are required to be of the enclosed type or be enclosed in standard motor rooms.

*Why is the term "dust-tight" employed in the rules for Class III and Class IV locations when these classes deal with combustible fibers?*

The term "dust-tight" is used in connection with the rules for Class III and Class IV locations because in many instances the lint or flyings approach dust in degree of fineness and to keep such lint or flyings from entering switch cases, etc., requires an enclosure practically as tight as one for excluding dust.

*How should resistance devices in Class IV locations be protected?*

Resistance devices in Class IV locations, unless in rooms equivalent in construction to standard motor rooms, are required to be enclosed in metal cases of dust-tight design and, in addition, must be so constructed that ignition of lint by direct contact with the case, whether in normal operation or in case of fault, be avoided. This can be accomplished by enclosing the inner case in a second case of larger size, thus reducing surface temperatures



*What precautions should be observed in the installation of fixed lighting units in Class IV locations?*

Fixed lighting units in Class IV locations are required to be located where they will not be injured when bales of fibers are tiered or handled. Further, the lamps and their sockets must be so enclosed that in event of burnout no spark or hot metal can escape from the enclosure. Suitable protection against the falling of sparks or hot metal from the unit is provided by affixing a piece of wire glass to the under side of the fixture.

*Are the switches, push buttons, lamps, bells, and contactors, such as used for signalling purposes in terminal grain elevators, required to comply with the rules for Class II locations?*

The rules for Class II locations require dust-tight globes on lights regardless of their use. It is also required that any device which creates arcs or sparks be enclosed in a dust-tight case. This includes bells, push buttons, switches, and contactors used on signal systems in terminal grain elevators.

*Are auxiliary gutters permitted in Class II locations?*

Auxiliary gutters constructed in accordance with the rules of Article 374 are permitted in Class II locations.

*Are standard oil break auto-starters (compensators) suitable for use in Class II locations, such as in a terminal grain elevator?*

Standard auto-starters in which the main contacts are immersed in oil are not approved for use in Class II locations. The cases of such starters are not dust-tight, as required by the rules, with the result that accumulations of dust within the case and in the oil tank are probable. Even though the starter is of the oil break type, the enclosing case must be of dust-tight design and construction.

*What portion of the usual type of filling station should be regarded as a Class I location?*

The Class I hazardous area in a gasoline filling station includes only the interior of the pedestal of the discharge device or pump. It is not

considered to extend to the canopy or station shelter.

*Are greasing and oil changing pits considered to be Class I locations?*

The greasing or oil changing pits in connection with filling or service stations are to be regarded as Class I locations. Where such pits are located in garages, electrical installations in them are subject to the rules of Article 510 covering garages.

*On the scale floor of a certain terminal elevator is a tile and concrete room used as an office by the weighmasters. There are no openings into the main building from this room other than a door opening which is protected by a tight-fitting, self-closing fire door. Is it permissible to use a radiant type electric heater in such a room?*

Weighmasters' offices or similar rooms in terminal grain elevators, if so built as to be practically free from dust, are not regarded as hazardous locations, and therefore ordinary radiant type electric heaters may be used in them.

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NOR-ELECTRIC



BULLETIN

DECEMBER, 1950

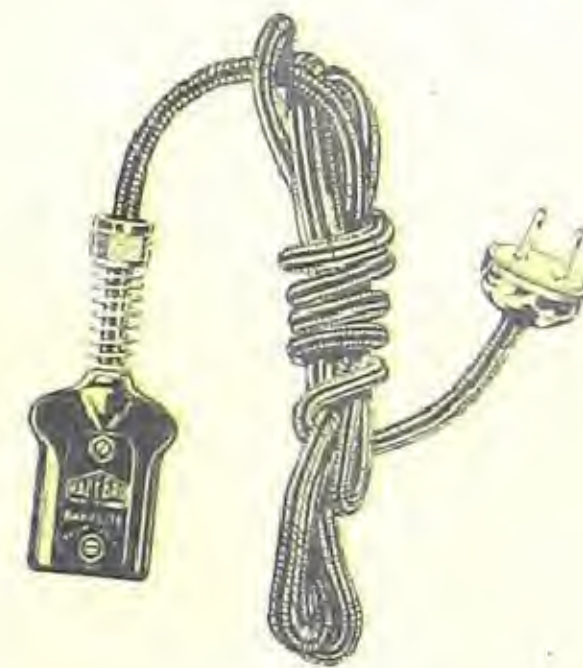
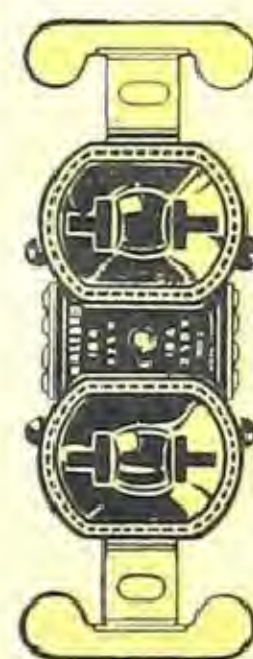
WIRING MATERIALS DEPARTMENT

W-4-8

# WIRING DEVICES

BY

**HALEBRO**  
MADE IN CANADA



*Distributed by*

**NORTHERN ELECTRIC CO. LIMITED**



## BAKELITE CAPS—PARALLEL BLADES

15 Amp. - 125 Volts



12

Cat. No.	Description	Std. Pkg.	Carton
821	Attachment Type	500	50
825	Handle Type	200	20

## RUBBER CAPS—PARALLEL BLADES

15 Amp. - 125 Volts



808

Cat. No.	Description	Std. Pkg.	Carton
12	Handle Type	250	25

## ATTACHMENT PLUG BASE

660 Watts - 250 Volts



812

Cat. No.	Description	Std. Pkg.	Carton
820B	Bakelite	500	50

## APPLIANCE PLUGS—BAKELITE



825



821

Cat. No.	Description	Std. Pkg.	Carton
<b>660 Watts - 250 Volts</b>			
810	Standard	250	25
810H	Standard - with Pull Handle	250	25
<b>10 Amp. - 125 Volts</b>			
808	Standard - with Side Outlet	250	25
811	Miniature Size - 1/2" Centres	250	10
<b>3 Amp. - 250 Volts — 6 Amp. - 125 Volts</b>			
812	Standard - with Switch	100	10



811



810-H



810



820-B



# **TRIPLE CURRENT TAPS AND TWO WAY SOCKETS, BAKELITE**

660 Watts - 250 Volts

Cat. No.	Description	Std. Pkg.	Carton
815	Triple Tap, Spring Blades	250	25
817	Current Tap	250	10
818	Two Way Socket	250	10



871



1309

# **FLUSH RECEPTACLES, BAKELITE**

10 Amp. - 250 Volts — 15 Amp. - 125 Volts

Cat. No.	Description	Std. Pkg.	Carton
873	Duplex, Parallel Slots	200	10
872	Duplex, T. Slot	200	10
871	Single, T. Slot	200	10



845



818

# **SURFACE AND FLUSH TOGGLE SWITCHES, BAKELITE**

5 Amp. - 250 Volts — 10 Amp. - 125 Volts

Cat. No.	Description	Std. Pkg.	Carton
1310	Flush, Single Pole	100	10
1311	Flush, Three Way	100	10
1309	Surface, Toggle, S. Pole	100	10



1310



815

# **CORD CONNECTOR, BAKELITE**

660 Watts - 250 Volts

Cat. No.	Description	Std. Pkg.	Carton
845	Round, Single Outlet	200	25



817



872

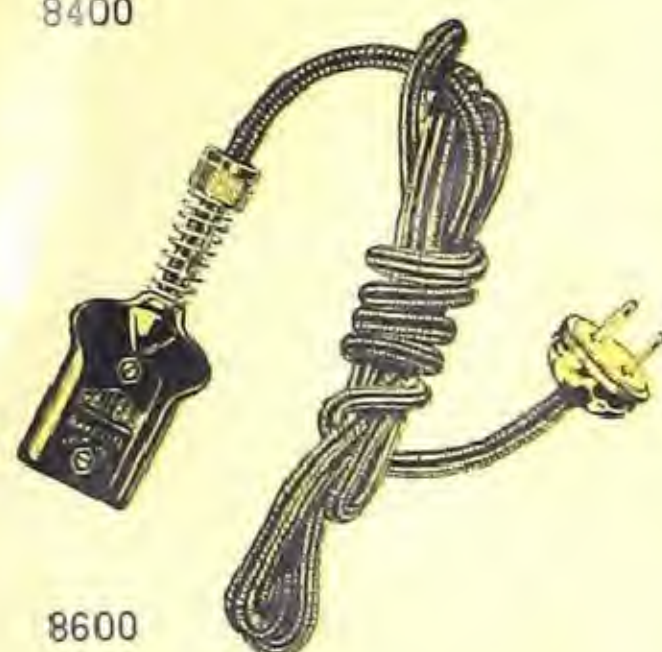




8351



8400



8600



708

## SOCKETS—BRUSHED BRASS

660 Watts - 250 Volts

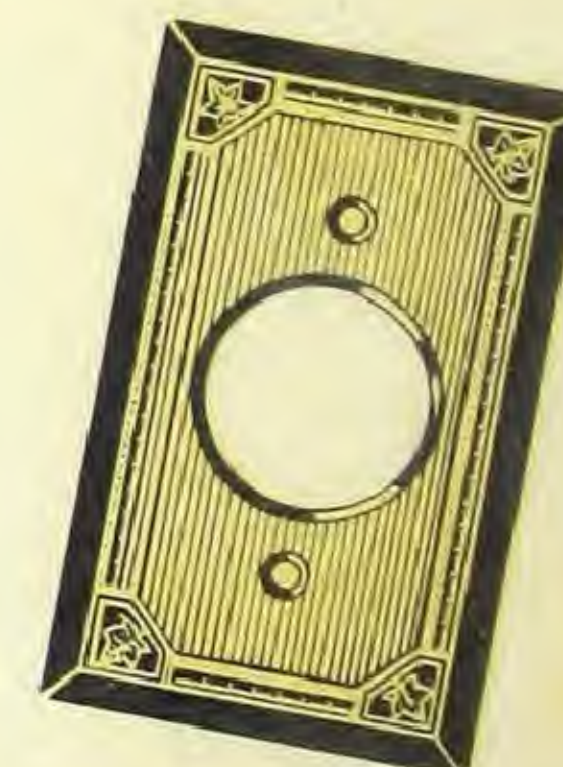
Cat. No.	Description	Std. Pkg.	Carton
8300	Standard Keyless	250	25
8400	Electrolier, Pull Chain	250	25
8351	Electrolier, Push Thru	250	25



T-10



R-20



R-10

## BAKELITE WALL PLATES

Cat. No.	Description	Std. Pkg.	Carton
T-10	Single gang, one Toggle Switch	100	25
T-20	Two gang, two Toggle Switches	50	25
T-30	Three gang, three Toggle Switches	25	1
T-40	Four gang, four Toggle Switches	25	1
R-10	Single gang, one Receptacle	100	25
SRT	Combination Single Receptacle and Toggle	50	25
B-1	Single gang Plate with Bar	50	25
T-1	Single gang Telephone Plate with Bar	50	25
R-20	Single gang for 1 Duplex Recept.	100	25
DRT	Comb. Duplex Recept. and Toggle	50	25

## BAKELITE APPLIANCE CORD SETS

Cat. No.	Description	Std. Pkg.	Carton
8600	Standard	100	—
708	With Switch	100	—

# Northern Electric

COMPANY LIMITED

HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
FORT WILLIAM WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA

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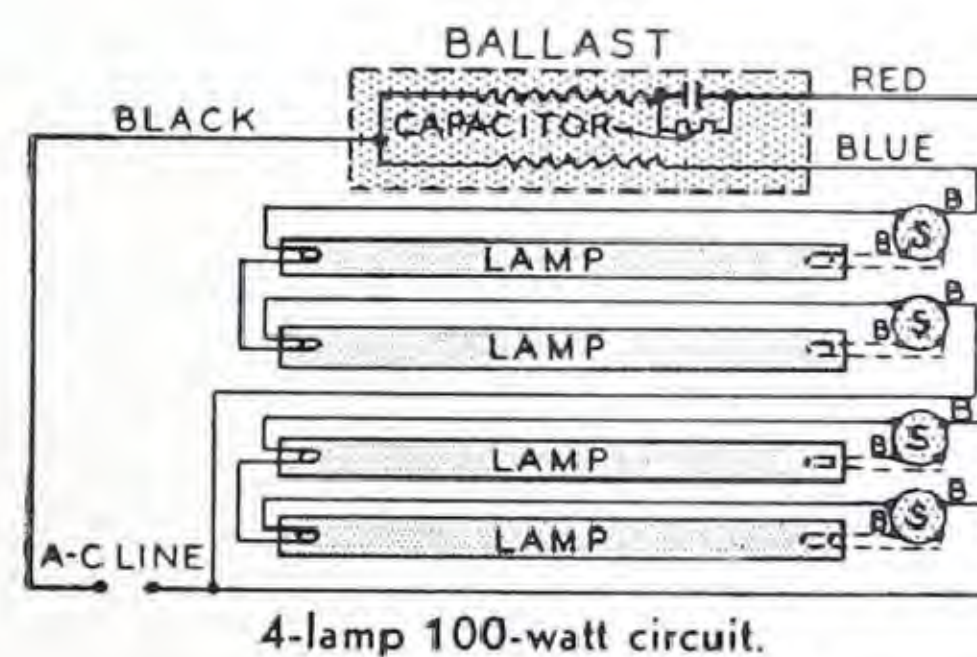
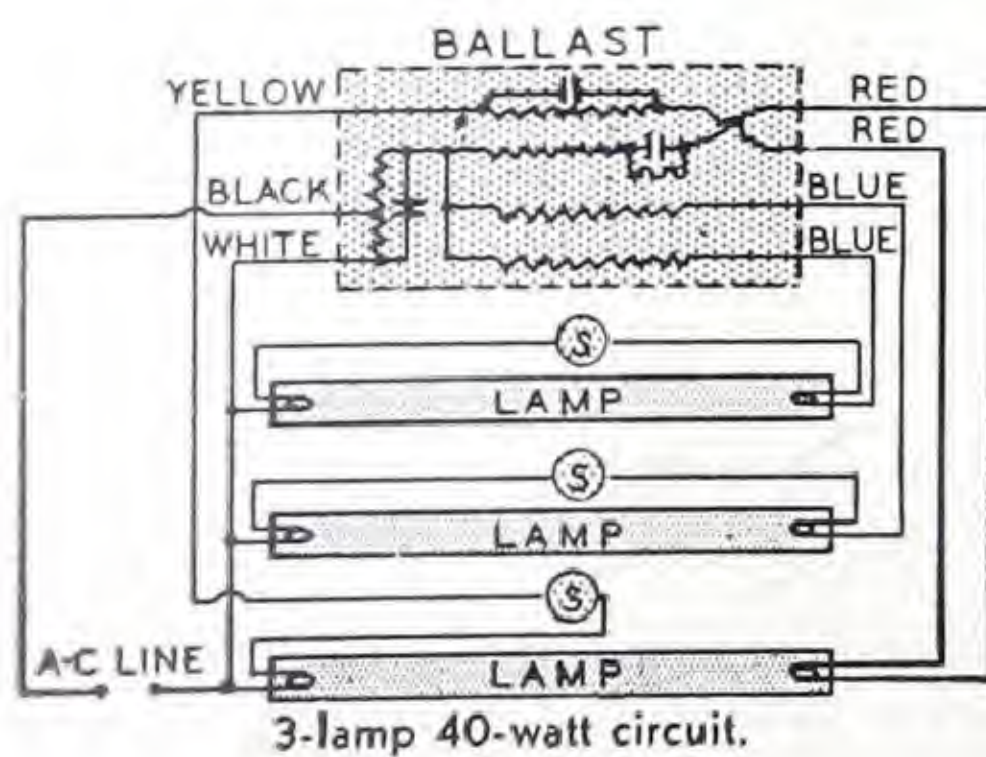
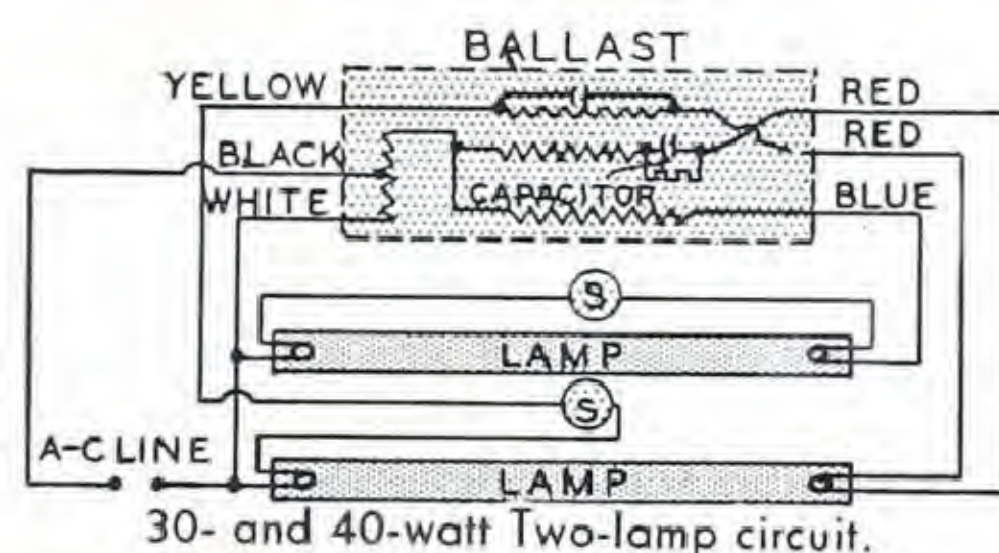


BULLETIN

# FLUORESCENT LAMP SERVICE SUGGESTIONS

Fluorescent Lighting equipment is fundamentally different from Incandescent Lighting fixtures in that every Fluorescent unit contains in addition to the lamps certain apparatus required to start the lamp and maintain a steady flow of current.

The purpose of this bulletin is to give information that will enable users of Fluorescent Lighting to get the utmost usefulness from their equipment.





### THE INSTALLER'S RESPONSIBILITY

When installing fluorescent lamps, it is necessary to check the rating of the ballast or the fixture against the rating of the source of electrical supply to make sure that the voltage and frequency of the electrical service fall within the limits specified. Best performance

will result when operating conditions adhere closely to equipment design. For instance, the best line voltage for 110—125 volt ballasts is 118 volts. Remember, it is only "the man on the job" who can say with assurance that the operating conditions are correct.

### THE USER'S RESPONSIBILITY

The user should appreciate the fact that his electrical system should at all times deliver the correct voltage. He should know that temperature is a factor in this new lighting. And that too frequent starting has an adverse effect on lamp life. He should understand the prin-

ciples of maintenance; the value of using "no blink" starters; the necessity of keeping lamps and fixtures clean; and the desirability of washing and painting walls and ceilings regularly for good maintenance of lighting levels.

### AVERAGE LAMP LIFE

The normal failure of fluorescent lamps is due, not to breakage of the filament as in the case of an incandescent lamp, but to the gradual dissipation of the active electron-emitting material—a compound of barium and strontium—on the cathodes.

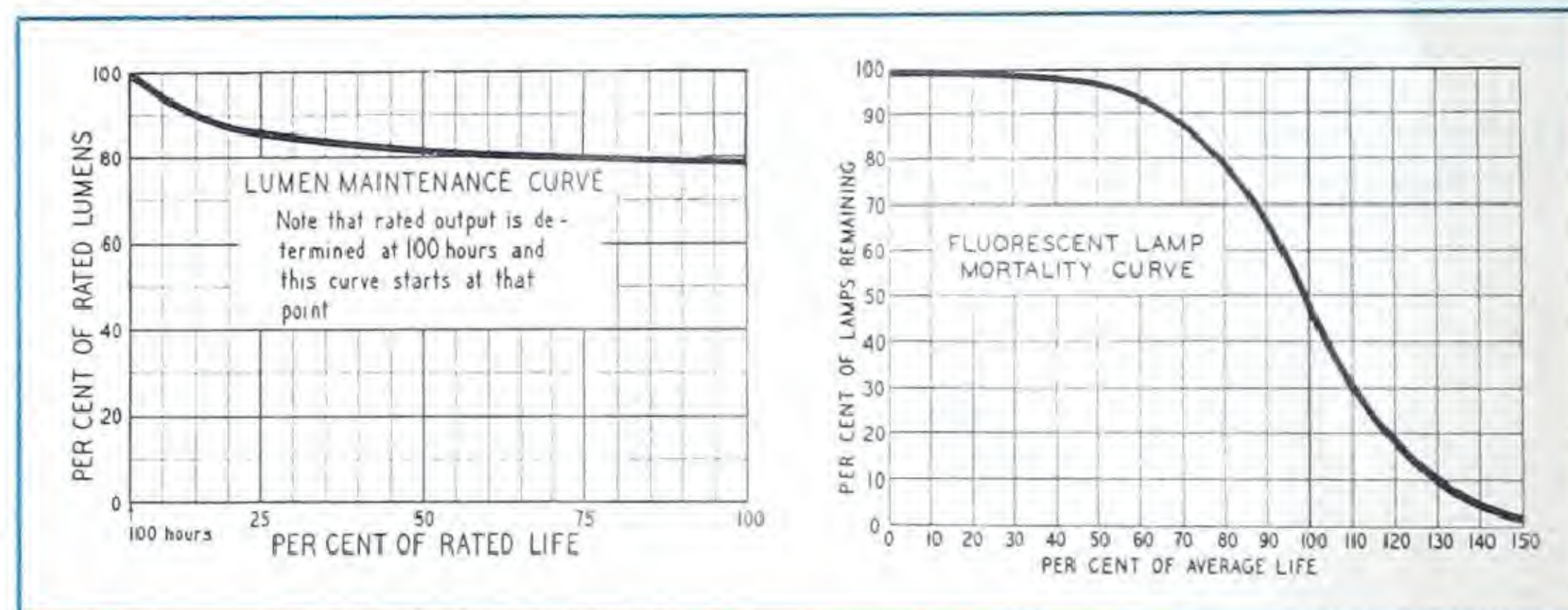
The more common sizes of fluorescent lamps have a rated laboratory life of 2500 hours and, like filament lamps, it is not unusual for some fluorescent lamps to fail after a few hundred hours, whereas others may last considerably longer than their rated life to balance out the normal early failures. (See chart on this page.)

The life of a fluorescent lamp is affected to quite a degree by the number of lamp starts and the starter characteristics. Lamp life is

usually lengthened as the number of starts for a given period decrease and vice-versa.

This is because the active electron-emitting material on the cathodes is more actively dissipated during starting than during normal operation. Lamp starters that do not give a long enough warming-up period also help dissipate cathode material. Rated lamp life is based on a normal burning period of 3 to 4 hours between starts.

The light output of a fluorescent lamp decreases rather rapidly during the first 100 hours of operation, the drop being as much as 10%. In fact, the depreciation during the first 100 hours is about as much as during the following 1000 hours. This is why we rate the lamps as their 100 hour value. (See chart on this page.)



At right is shown the Fluorescent lamp mortality curve which indicates how some lamps fail early in life while others last longer than a normal life to average out the life of a quantity of lamps to 100% of rated life.

At left the Lumen (light) maintenance curve—starting at 100 hours of burning—shows how light output slowly decreases with age.

### IMPORTANCE OF MAKING PROMPT REMEDIES

A lamp that is not operating perfectly should immediately be disconnected from the circuit for these reasons:

- (1) In the case of a two-lamp ballast, the operating conditions of the second lamp are upset to a point where they are detrimental to lamp life.
- (2) If the lamp is not removed the starter or lamp will be burnt out and the ballast could easily be damaged (where "no-blink" starters are not used).
- (3) A "blinking" lamp is very annoying.

If when using a "no-blink" starter it continually locks out, operating conditions are not normal. The use of "no-blink" starters will eliminate about 75% of the common troubles caused by either low voltage starting or end of lamp-life "blinking." When ordinary starters are used, the fixture should be turned off immediately if there is any indication of improper operation. Otherwise damage to lamp, starter or ballast may result.



## Trouble Symptoms and Correction

### LAMP MAKES NO STARTING EFFORT OR STARTS SLOWLY:

Be certain the lamp makes proper contact in the lamp-holders. A fluorescent lamp can be checked for an open circuit in the lamp by testing it in another circuit. Also, it is possible that the starter has reached the end of life and should be replaced.

### LAMP BLINKS "ON" AND "OFF" AND DOES NOT START:

This simply may be a normal lamp at the end of its life. But if the lamp is new or if it has not been in service long, the following factors might cause this action:

- (1) A defective starter, *which can readily be replaced.*
- (2) The lamp may be at fault, so lamp replacement may be the next logical step.
- (3) Low line voltage—check line voltage.
- (4) If two-lamp ballasts are involved, there is a possibility that the individual starter leads are incorrectly connected (criss-crossed). When this is the case, the two lamps may start promptly if both starter switches open simultaneously. However, if one lamp starts, the other lamp may blink on and off for a long period of time or may not start at all. This sort of trouble is generally easy to locate, because after one lamp starts only one end of the other lamp will light up before the starting effort is made. Also, one lamp will not make a starting effort unless the other is in the lampholder. Thus, by testing each of the two lamps separately, this wiring fault can be detected easily.
- (4a) (1) Starter in compensator lead rather than in ballast lead—this can happen because both are red colour.
- (2) Lack of compensator in leading circuit.

### ENDS OF LAMP REMAIN LIGHTED:

In a new installation it is of course possible for the circuit to be incorrectly wired. However, if the installation has been in operation, the trouble may be due to a short circuited condenser in the starter, or it is possible that the starter switch contacts are welded together. In either case it is necessary to replace the starter.

### HIGH OR LOW VOLTAGES:

If lamps are used on higher than rated voltages, the operating current becomes excessive and may not only overheat the ballast, but also cause premature blackening and early lamp failure. In the case of excessive undervoltage, the current may be too low for satisfactory preheating of the cathodes and the lamps may flash "on" and "off" without starting, until locked out by the "no-blink" starter. Thus, either too high or too low voltage operation is injurious to the lamp.

A sudden drop of voltage may put all the lamps in the lighting system out, causing the lamps to be restarted more than normal thus reducing the lamp life.

### LAMP APPEARANCE:

At the end of life, the lamps usually show some blackening at either one end or both ends. There may also be dark rings slightly brownish in colour at one end or both ends. However, on the average, there should be very little indication of blackening or rings during the first 500 hours of operation. Any unusual appearance or performance from a factory or shipping defect will usually develop during the first 200 hours of service.

### EARLY END BLACKENING:

Heavy end blackening early in life means that the active material on the electrodes is being sputtered off too rapidly and indicates improper operating conditions.

The causes may be as follows:

1. High or low voltage. For best results, circuit voltage should be within the ballast rating.
2. Loose contacts (most likely at the lampholder) causing lamps to blink "on" and "off." Remedy: Lampholders should be rigidly mounted and properly spaced. See that lamps are securely seated in lampholders.
3. Improperly designed ballasts. Remedy: The use of ballasts

of reliable manufacture in accordance with the Lamp Manufacturers' specifications will eliminate trouble of this nature.

4. Improperly designed starter. Remedy: Use of starters within the limits of the Lamp manufacturers' specifications.

5. Defective or worn-out starter causing end of the lamp to remain lighted over a period of time. Remedy: Replace with a new starter.

6. Omission of the starting compensator in the leading branch of a two-lamp ballast circuit for 15-, 20-, 30-, or 40-watt lamps. Remedy: Install a compensator, or in case of ballasts with built-in compensators check connections.

### BURNED-OUT CATHODES:

Under normal operating conditions, it is very unlikely that sufficient current can be drawn from the ballast to burn out the cathodes. A trouble of this nature indicates an abnormal circuit or operating condition.

Cathodes may be examined by viewing the end of the bulb against a pinhole of light which casts a shadow of the cathode on the bulb wall, or check with 60-watt lamp in series with 120 volt line. In this way, it can be observed whether or not the cathode is intact.

There are several common causes of burned-out cathodes. If one end of the lamp is inadvertently placed across a 115-volt circuit, the cathode will generally burn off at both leads with little or no fusing of the metal. Broken lampholders, lampholders with starter sockets attached and surface-mounted on metal, one strand of the stranded conductor touching a grounded fixture, and improper wiring are all common causes of either momentary or permanent grounding which can burn out the cathodes. Also the operation of a fluorescent lamp on direct current without the necessary additional resistance required, is a common cause. An air leaking lamp is also a very common cause of a burnt out cathode.

### FLICKER:

Under this heading "flicker" does not refer to the high-frequency stroboscopic effect which is noticeable when observing a fast moving object under fluorescent lighting and which results from normal variations of light output on alternating current, but rather to effects commonly known as "spiralizing," "swirling," "snaking," etc.

These forms of flicker are all apparently related to a single cause and are thought to be the result of particles of cathode coating material, ejected by faulty starting, travelling down the arc-streams.

A new lamp may flicker in such a manner when first placed in service, even though it has gone through an aging process at the factory to reduce this tendency as much as possible. In a new lamp, this tendency will usually clear up after the lamp has been operated for a short period or has been turned on and off a few times.

### COLOUR QUALITY:

In passing judgment on variations in colours of fluorescent lamps, great care must be used to avoid illusions, as lamps of exactly the same colour may appear quite different in various locations of a given installation.

These illusions are usually due to effects of differences in reflector finishes or from coloured paints used for decorative purposes. Always interchange the lamps before forming a conclusion where differences of colour are involved. The eye is quite critical in comparing colours, and the slight differences within the manufacturing tolerances of both white and daylight lamps may be discernible, although the differences are seldom objectionable.

When the bulb-wall temperature is low, the lamp appearance is more pinkish than when warmed up.

### RADIO INTERFERENCE:

The mercury arc of a fluorescent lamp causes a sparking action at the lamp cathodes which in turn generate weak radio waves.

The direct radiation of these waves are dissipated within a few feet of the lamp and can, therefore, be easily controlled by the proper positioning of the radio and its aerial. Interference from radiations carried back by electric supply lines can best be minimized by the proper application of line filters at each lamp or fixture.

Where only one or two radios are located near a fluorescent installation and the aerial circuit has been properly shielded from bulb and line radiations, a single line filter located at the radio power outlet will usually suffice.



**WHAT TESTS ARE IMPORTANT:**

The only tests on fluorescent equipment that will be of interest are those which will quickly tell what parts of a fluorescent unit are inoperative, and do it in the shortest possible time.

There are four main elements in every fluorescent circuit:

1. The lamp.
2. The starter.
3. The ballast.
4. The source of electrical supply.

If we can eliminate quickly three of the most likely variables our problem is readily solved.

From the outline of possible troubles covered in the previous parts of this article the probable causes are indicated. As you will have noted, the centres of trouble are (1) starter, (2) lamp, (3) voltage, (4) ballast and wiring.

**TEST EQUIPMENT:**

The equipment needed for getting a fluorescent lamp system back in operation or checking a short lamp life complaint are:

1. A high resistance voltmeter to cover a range of from 0 to 300 volts in two ranges.
2. A spare lamp of the right size for the system being tested.
3. A spare starter of the right size for the system being tested.

These two pieces of additional equipment will also be found useful but are not absolutely essential.

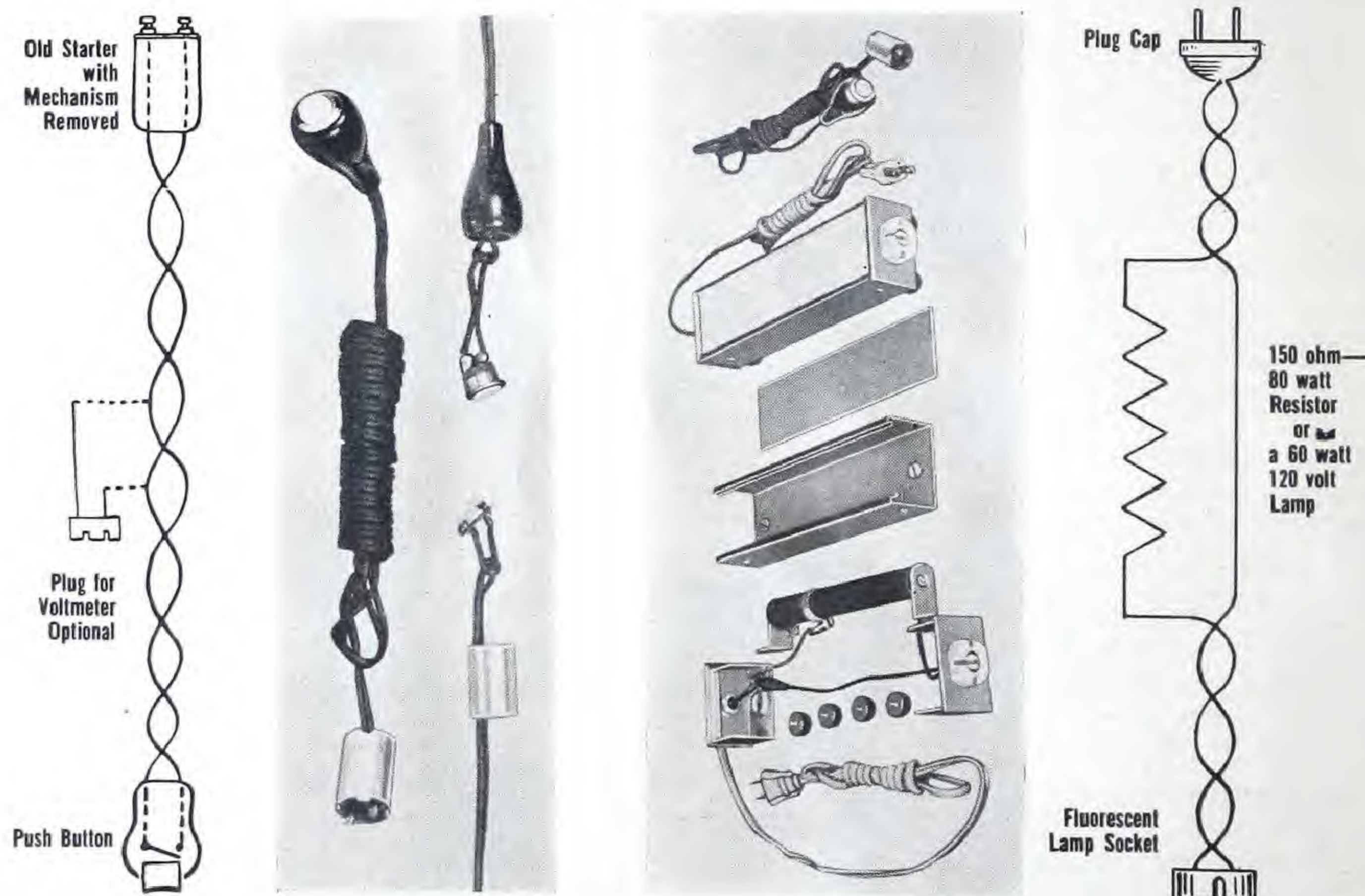
1. A cathode tester for checking cathode continuity and operating condition.
2. A dummy starter for observing the starting cycle and manually starting lamps or with voltmeter attachment for checking starting and operating voltages of lamps.

With the cathode tester it is possible to check lamps out of fixtures for:

1. Open or broken cathodes—the cathode will not light.
2. A normal cathode—bright fluorescent glow.
3. A deactivated cathode—yellow glow.
4. Lamp leaking air—dull red glow (filament usually burns out under test).

The dummy starter can be used to check lamps in fixtures for operating conditions as follows:

1. To observe the colour of the cathode glow.
2. To manually start a fluorescent lamp.
3. With voltmeter attachment to check available starting voltage and lamp operating voltage.



This Bulletin is based on information furnished by Canadian General Electric Company Limited, manufacturers of G. E. Lamps

# Northern Electric

COMPANY LIMITED

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							VICTORIA

Revised February 1947—L-0-4 5500—2-47





July 1945

L-0-5

NOR-ELECTRIC



BULLETIN

**MAKE  
SCHOOL DAYS  
BRIGHTER  
DAYS**





## Is Your School Properly Lighted?

Compare the lighting in your school with this example of a properly lighted room and see how it measures up.

- (1) Is the lighting as good on **inside row** of desks as at those near windows?
- (2) Do the present light fixtures produce glare in the children's eyes?
- (3) Can work on the blackboard be seen easily?
- (4) Is the blackboard work seen equally well by **all** children in the room?
- (5) Are the windows provided with suitable shades to control glare from natural day-light?
- (6) Do the children complain of headaches or seem abnormally backward?

## Steps To Be Taken In Adequate Lighting Of Class-Rooms

- (1) Determine the quantity and quality of light necessary for the task being performed in the room.
- (2) Determine the type and size of lighting fixture necessary to give the above results.
- (3) Calculate the wiring capacity necessary to supply the lighting load and thus determine whether an increase in your system is necessary.
- (4) Plan to equip the windows with venetian blinds or suitable shades to control excessive day-light glare.
- (5) Choose room decorations to include a lustreless ceiling and light toned upper walls to make the lighting more effective.

## Planning the Lighting

Because conditions vary so, it is not possible, in a bulletin of this kind, to make definite recommendations for solving your lighting problems. We will endeavour, to show you the necessity for adequate, planned lighting in schools and are ready to assist you in preparing plans and specifications for existing or proposed buildings. Our experience is yours for the asking. Get in touch with our nearest office, there is no charge or obligation.



## An Example Of . . .

### POOR ILLUMINATION

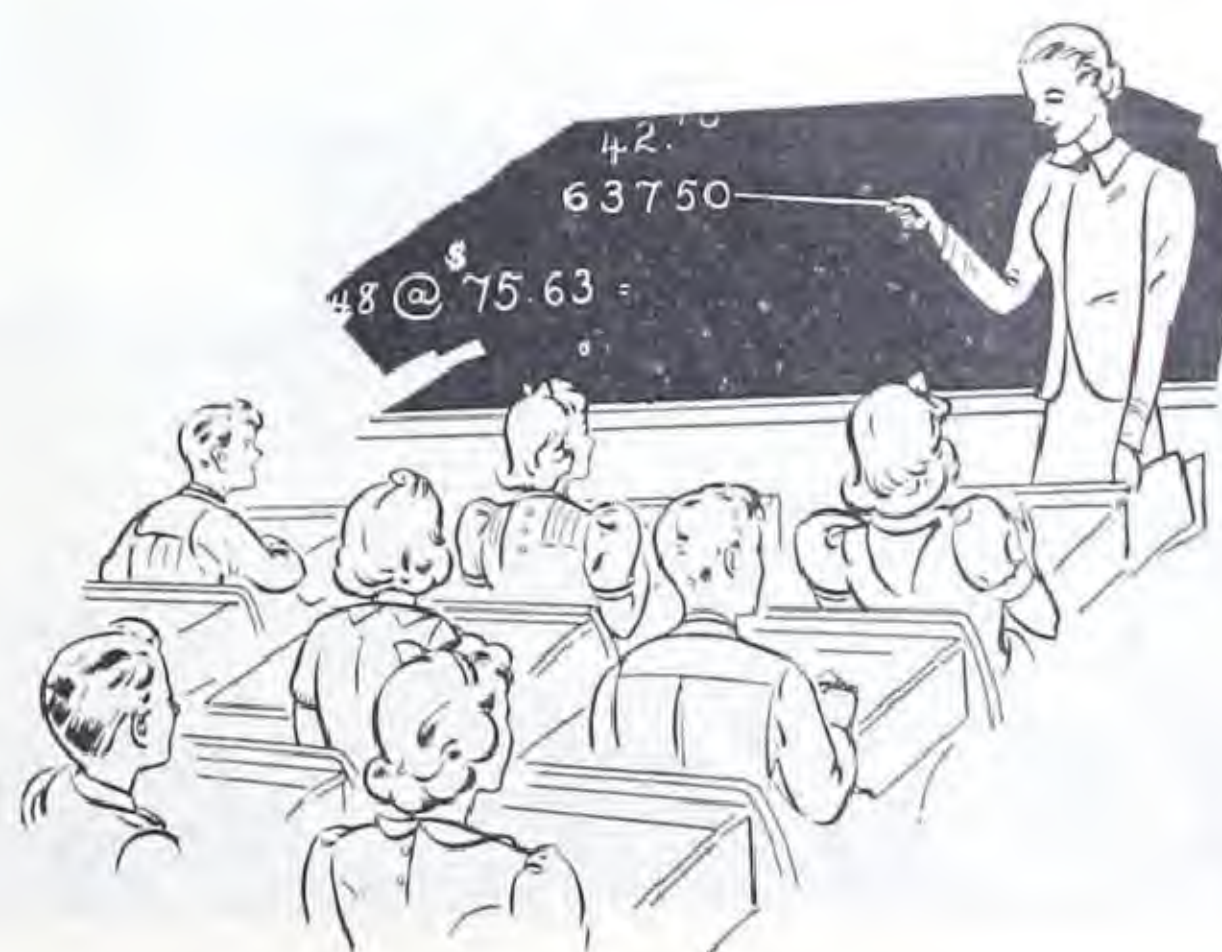
Poor lighting with glare conditions results in a listless, unattentive attitude in the pupil thus retarding his progress. This causes added expense to the parents and school districts due to "Repeaters" or children requiring more than the normal time to graduate.



## Versus

### GOOD ILLUMINATION

Good quality lighting makes an eager, attentive class. The child is not held back due to eye fatigue and its effect on the nervous system.





## *Which Shall It Be...*

### FLUORESCENT *or* INCANDESCENT?

In both the designing of lighting for a new school building and in the relighting of an old one, the first question currently considered is "Should fluorescent or incandescent be used?" There are many factors which influence the decision, as first cost, power rates, foot-candles required, wiring, type of room, quality of light needed.

Some characteristics of standard fluorescent lighting are as follows:

- (1) High efficiency—from two to three times as much light from the lamps for the same total wattage.
- (2) Lower brightness sources—of importance where lamps are exposed to the eye.
- (3) Light mixes well with daylight.
- (4) Long lamp life.
- (5) Higher first cost.
- (6) Lower operating cost.
- (7) Requires less wiring capacity.
- (8) Newest form of lighting.

Incandescent lighting has the following considerations:

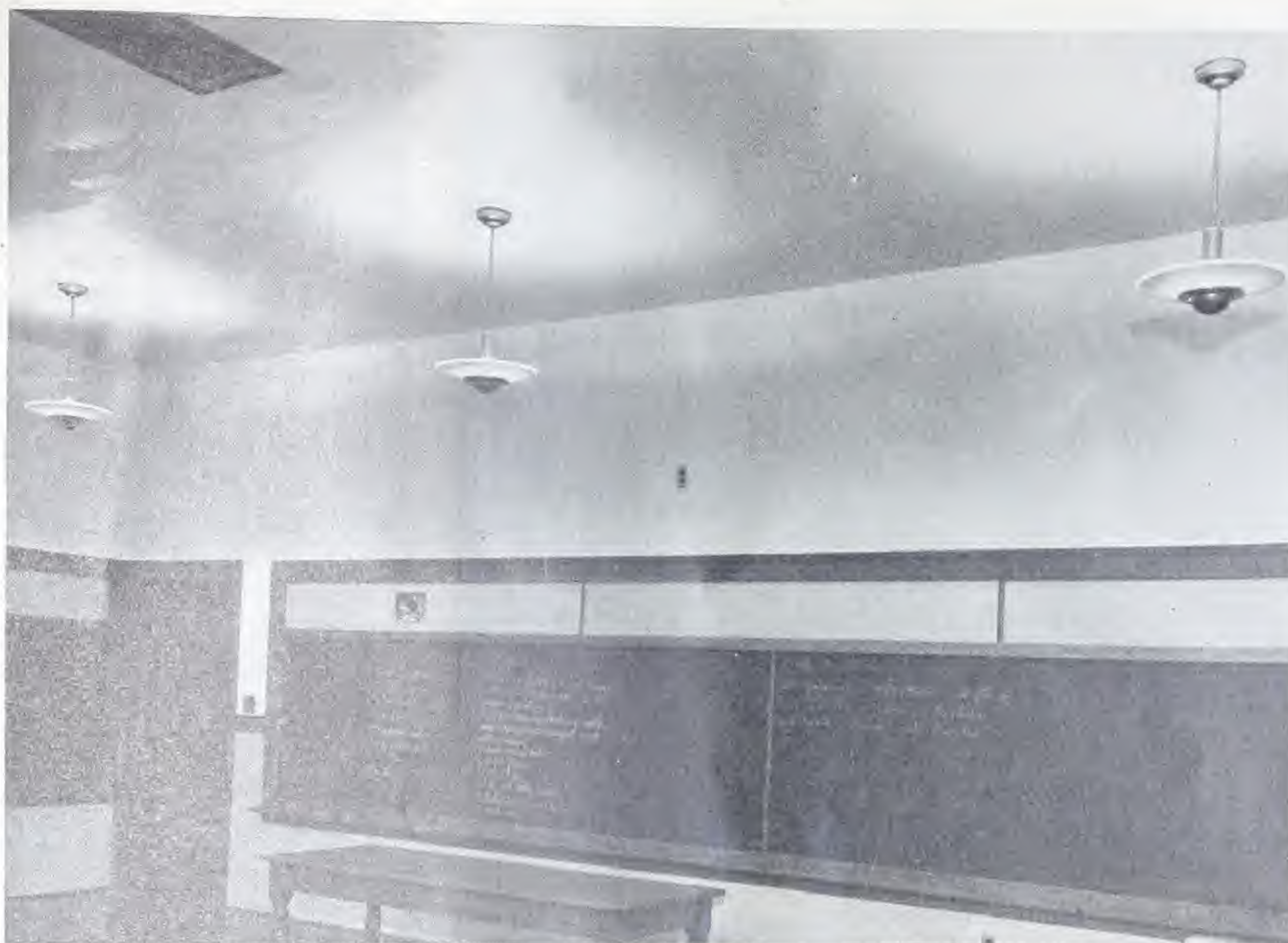
- (1) It is simple to use.
- (2) Lamps are higher in wattage—fewer required.
- (3) Well adapted to indirect and semi-indirect lighting.
- (4) It costs less per pupil per year than any other kind.
- (5) Used extensively in school lighting.

### *Examples of Fluorescent and Incandescent Lighting*





## *Eliminate Glare*



*A Typical Classroom Featuring Glareless Illumination*

There are two common types of glare—direct and reflected. BOTH SHOULD BE CAREFULLY AVOIDED.

Direct glare is caused by light which reaches the eye directly from the source of light. This may be experienced when looking at a brilliant unshielded incandescent lamp or a comparatively small, bright lighting unit, especially when viewed against a dark background. General lighting luminaires should be hung rather high to keep them well above the normal line of vision. They should be properly designed to limit both the brightness and the quantity of light emitted in directions immediately below the horizontal since such light tends to enter the eyes directly and interfere with vision.

Reflected glare occurs when bright images of windows or of artificial light sources are reflected into the eyes from shiny surfaces on walls, ceilings or work area. It is particularly bad when glare is reflected from the working surface as so often happens with glazed paper, glossy desk tops, glass table tops or shiny blackboards. Reflected glare is worst when the light source is uncontrolled sunlight or artificial lighting equipment of relatively small size and high brightness.



## *Sight Saving Classrooms*



One of the most serious problems in school lighting arises in connection with that small percentage of pupils whose eyesight is so defective as to demand special consideration. It is becoming more and more the practice to place such pupils in special classes under expert care. Separate rooms are usually provided in which the students do their close eye work, and in almost all cases these are equipped with special furniture and mechanical equipment and excellent natural lighting conditions are provided. Since the eyes of such pupils are unable to function normally, compensation should be provided in the form of artificial lighting of proper amount and quality. It is recommended that not less than 30-50 foot-candles of indirect illumination be provided.

## *Light Reflection Value and Finish of Ceiling and Walls*

It is well known that in addition to proper lighting facilities, the colour and texture of the paint on the walls and ceiling are important.

The walls are directly in the line of vision and a tint with a reflection value of 50-60% should be used for the upper walls. Lighter colour walls only appear annoyingly bright; darker walls decrease the illumination and introduce uncomfortable brightness contrast.

The dado, or wall area below the window sills, may be of a moderately dark colour.

The ceiling should reflect at least 75% of the light which strikes it; higher values are desirable. While white is the most used finish, tints may be used such as bluish white, light cream or ivory.

Compare the two illustrations shown below of the same class room and notice how improved lighting and proper painting affect the appearance of the room.

BEFORE

AFTER





## *Lighting For Various Purposes*

### FOR THE LIBRARY...

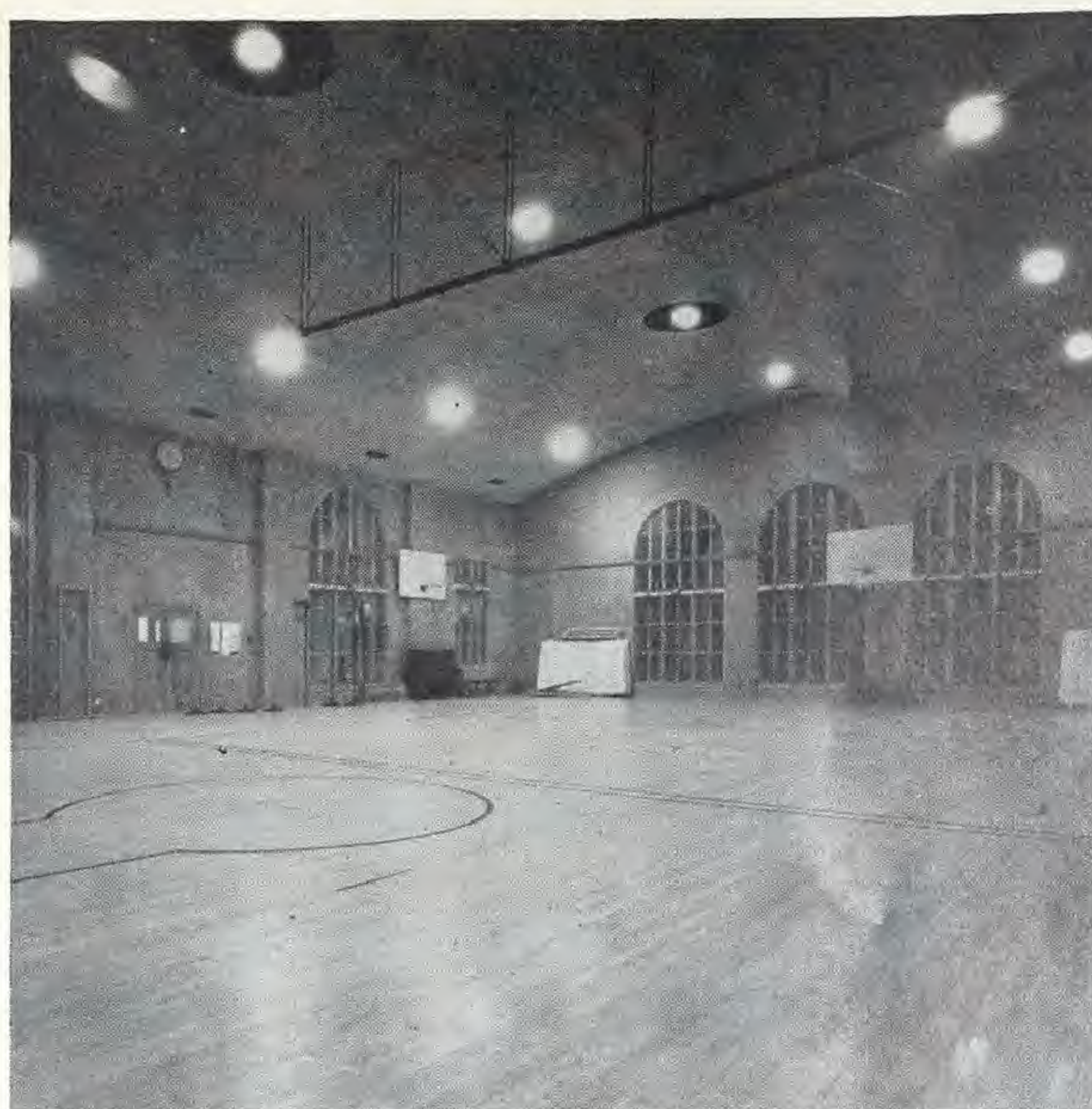
The library should be provided with well diffused illumination for the entire room. Reading is done in practically all parts of the room as students often refer to books at the wall cases or stacks.



### FOR THE LABORATORY...

Laboratories should have the same general illumination as classrooms. Small, portable table-type reflectors assist greatly in microscope work and in reading delicate instruments. Plenty of convenience outlets should be provided at the work tables and at the sides of the room to connect electrical apparatus, and portable lighting equipment for experiments. High intensity lighting should be provided for demonstration tables which must be seen from all parts of the room.



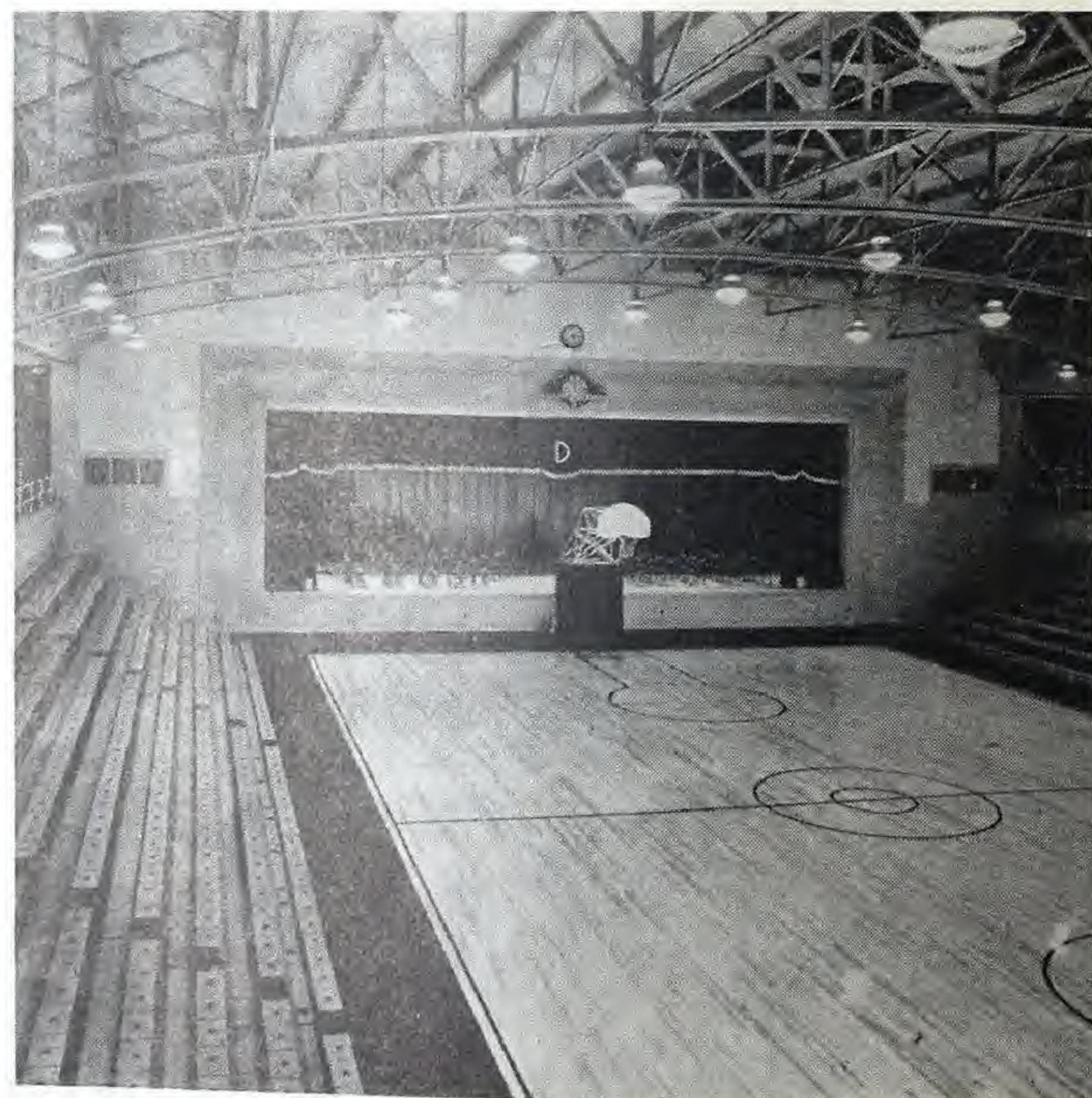


### FOR THE GYMNASIUM...

Lighting in the gymnasium should be of the amount recommended for the purpose for which the room is used and uniformly distributed throughout the room. Glare, uncomfortable to players and spectators, should be minimized as far as practicable. Luminaires should be protected by suitable guards. In most cases these requirements can be met with general lighting from a system of direct, semi-direct, or general diffusing luminaires, mounted high and suitably protected.

### FOR THE AUDITORIUM...

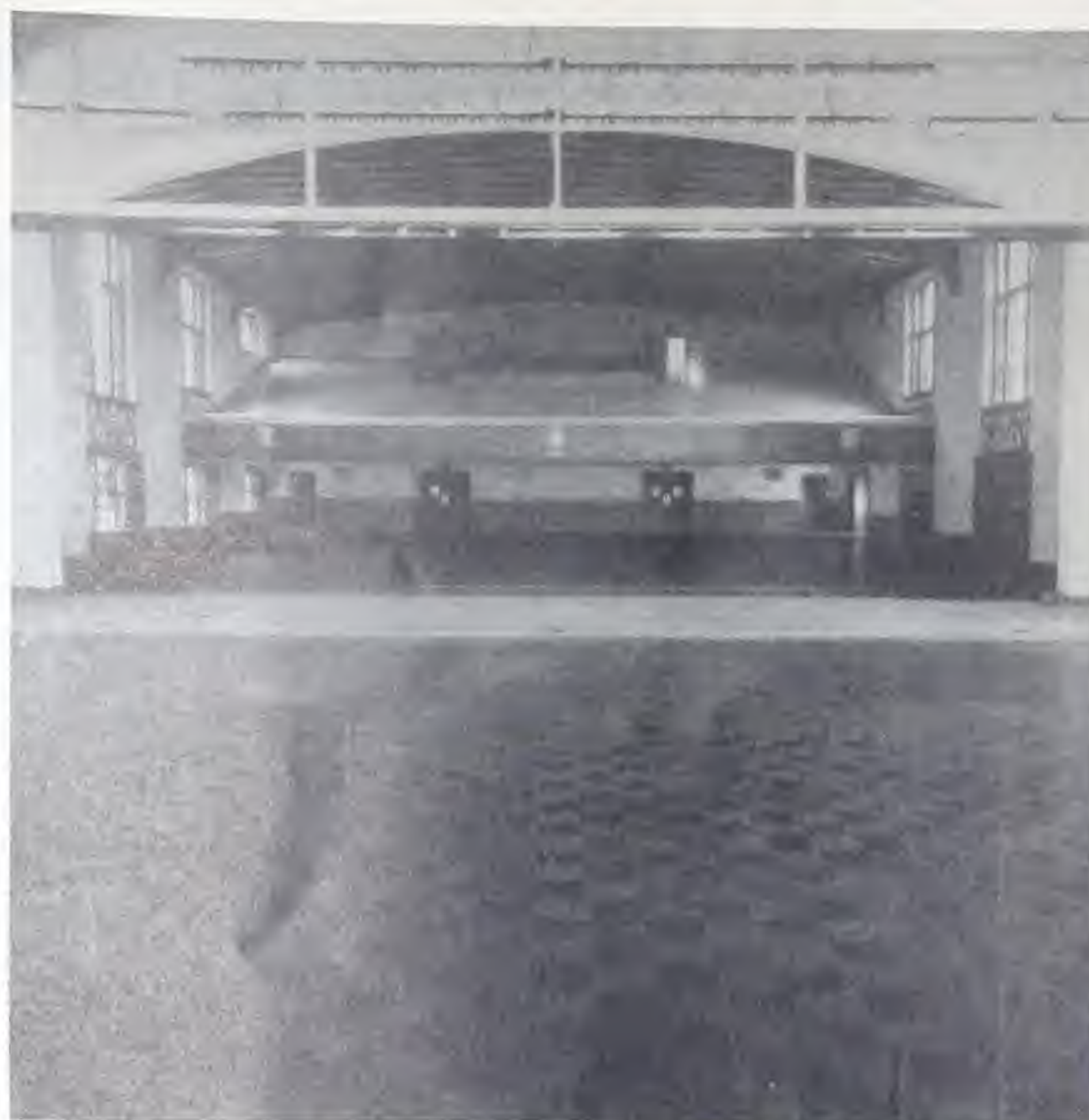
Well diffused comfortable illumination is greatly to be desired in the auditorium. Indirect or semi-indirect luminaires of a decorative nature and built-in equipment are usually most suitable. Illumination to the order of 6 foot-candles is suggested for the customary uses of the auditorium. Small, bright wall units should never be used at the front and sides, since these are very annoying to the audience and tend to distract attention.





### FOR THE STAGE...

More and more attention is being given the schools in the encouragement of the dramatic arts. Nothing is more discouraging to amateur players and their audiences than attempting to stage an acceptable presentation without at least fairly good modern stage lighting. It is strongly recommended that this be taken into consideration and adequate provision be made to accomodate good border lights, foot lights, spot lights and other lighting necessities of amateur theatre groups.

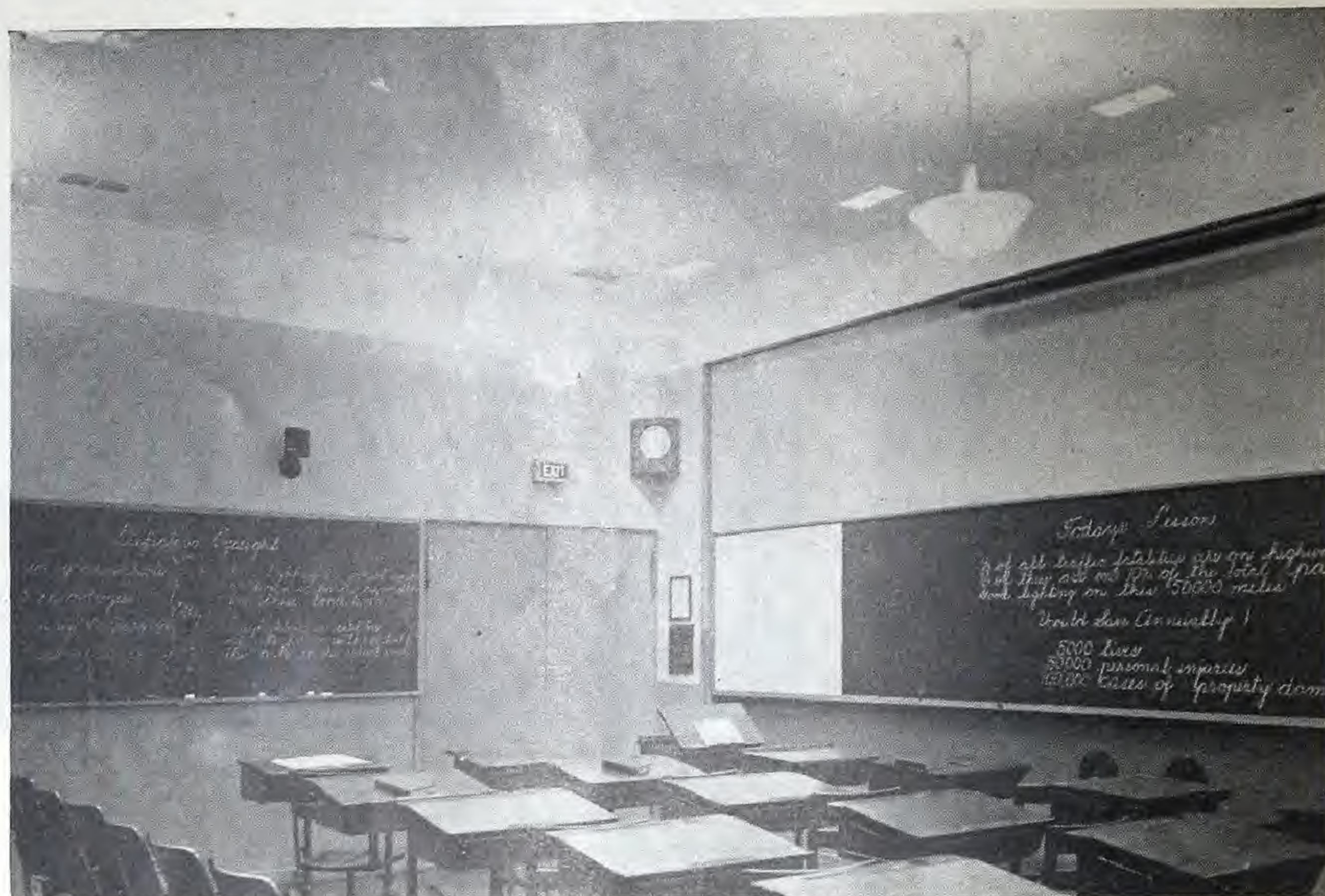


### FOR CORRIDORS, STAIRWAYS, ETC...

In these places an illumination of at least 4 foot-candles is suggested. Enclosing general diffusing or semi-indirect units are most suitable although small indirect or semi-indirect luminaires may often be used to advantage in corridors and entrance lobbies. In the case of stairways an overhead lighting unit should be provided at each landing. Small wall type units at stairways and landings are directly in the line of vision and often make it difficult to see the steps clearly.



## *Illuminating the Blackboard*

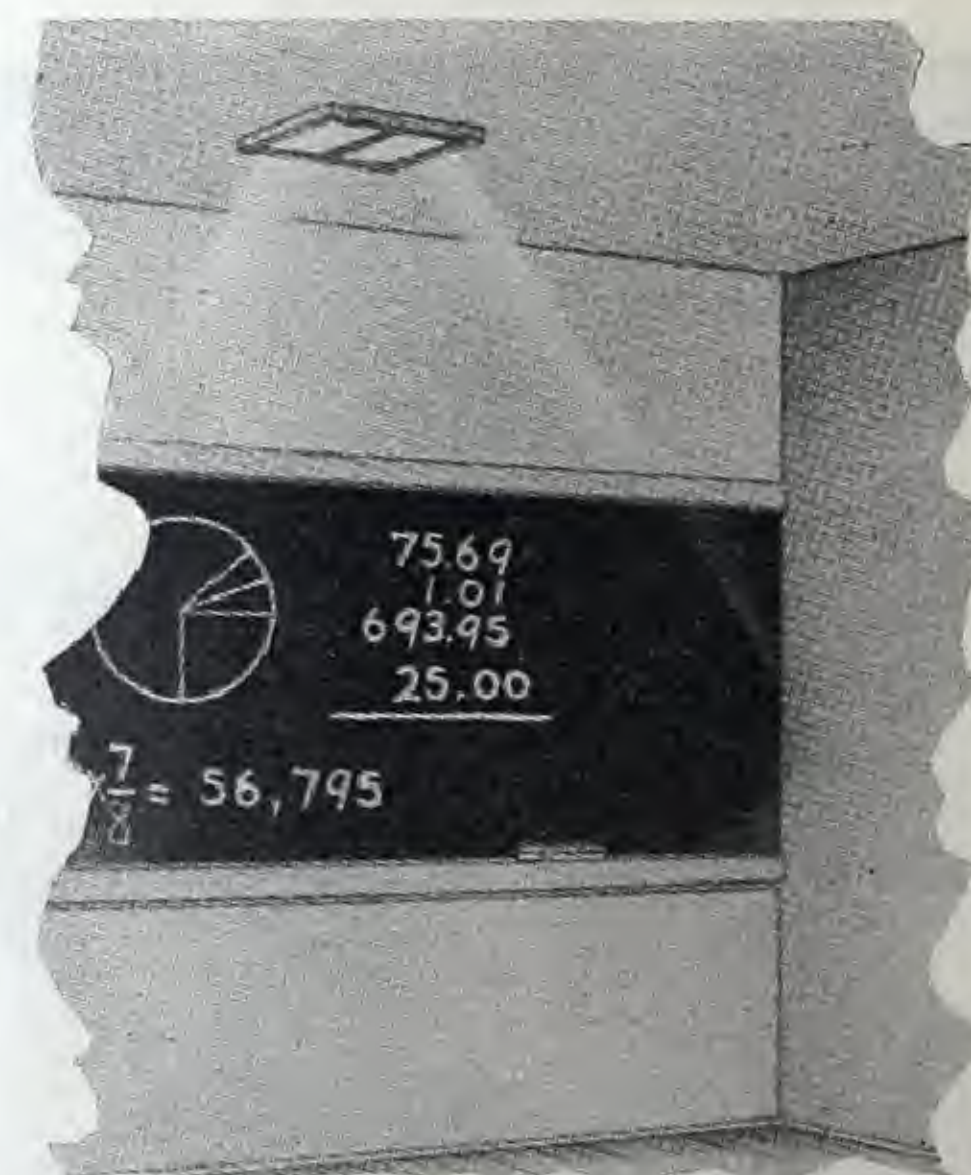


More and more visual instruction is being given in schools. Blackboards have always had an important place in teaching. Often the surfaces and chalk have not been very good and daylight reflections and inadequate lighting have made seeing difficult.

The blackboard should be illuminated without reflected glare from the inside lighting or from daylight through the windows.

Lighting for the blackboard may come from units mounted at the top of the board or may be recessed in the ceiling above the board using a directional lens.

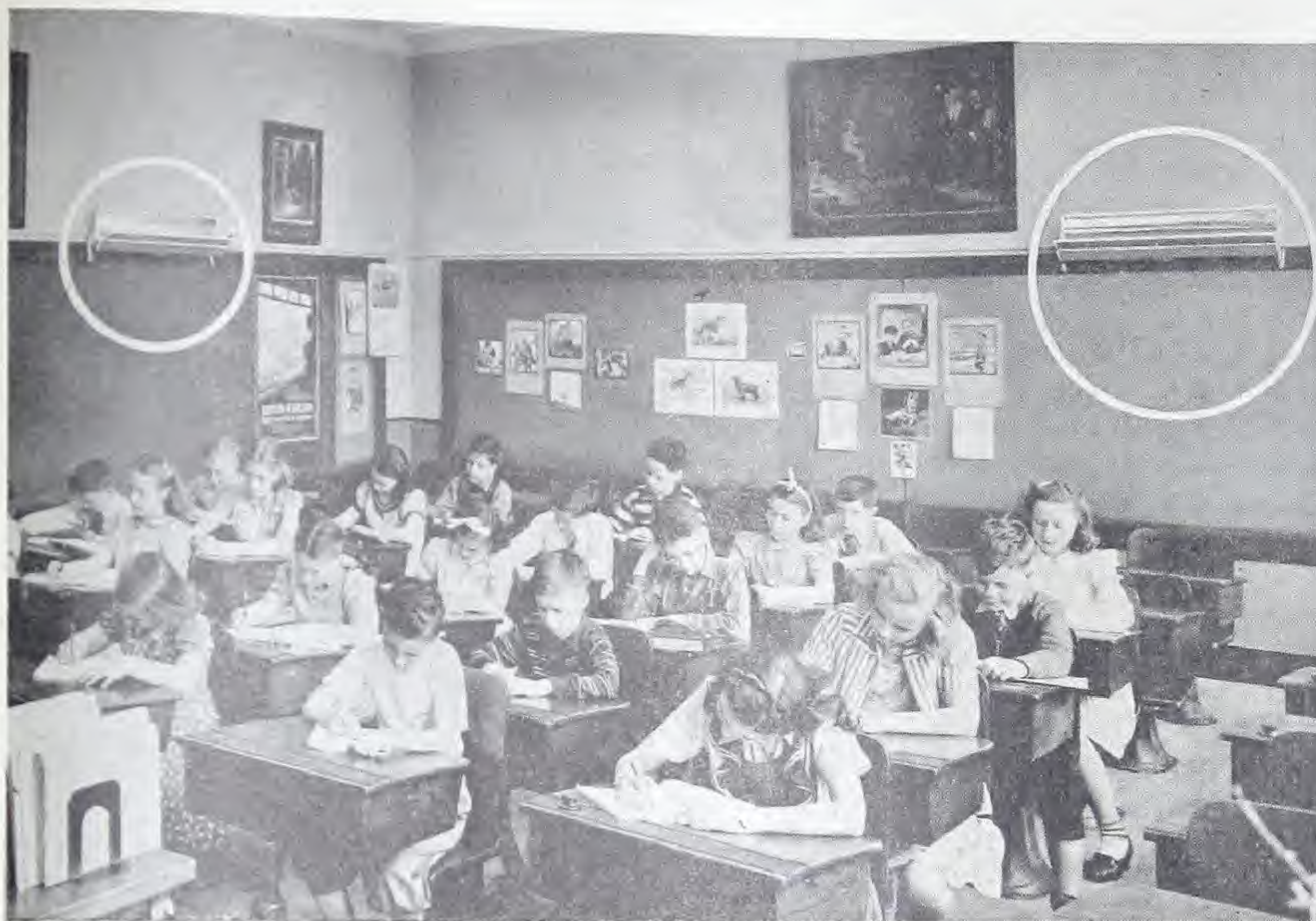
The second method may be advisable in that the lighting equipment does not interfere with maps, etc., above the board.



This fixture is mounted on the ceiling and throws a narrow beam of light on the blackboard (something like an automobile headlight) carefully controlled so that practically none is wasted. Each fixture requires two 150 watt clear lamps. Note that this fixture is so placed that no light is reflected toward the children.



## *Germless Classrooms*



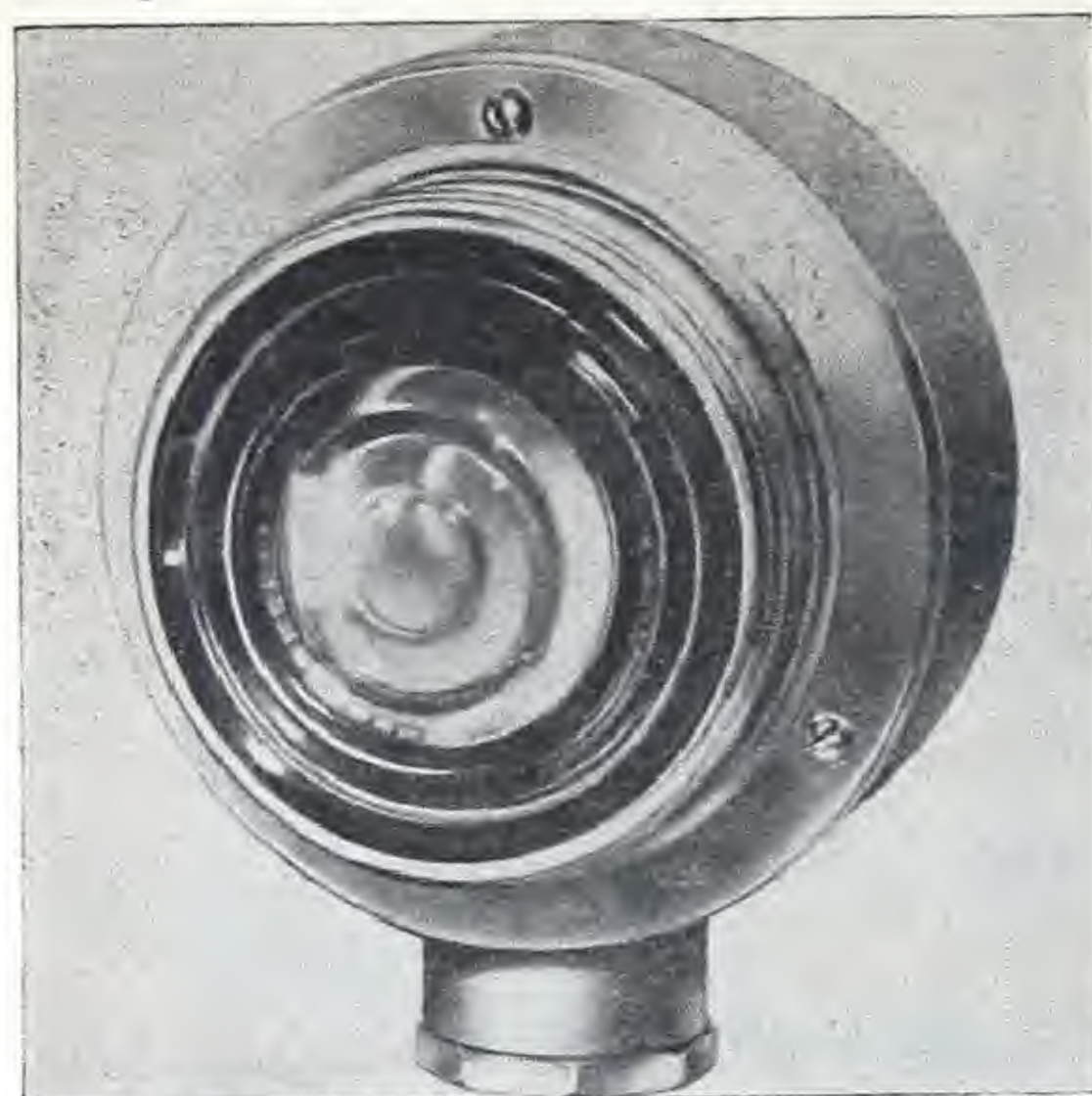
Wherever people are, there you will find air-borne germs which cause the spread of respiratory diseases. Air-borne germs and bacteria have the physical characteristics of extremely fine dry dust particles and are ordinarily invisible to the naked eye.

Bacteria are expelled from the nose and throat by coughing and sneezing in droplets of moisture. These droplets dry out but the bacteria remain suspended and drift long distances, borne on every current of air. Many of these germs are of the streptococci type, responsible for serious throat infections, erysipelas, scarlet fever, etc., and are commonly present in human noses and throats, even in the absence of infected tissue. For this reason, they are present in occupied rooms directly proportional to the number of persons present.

The destruction of these air-borne bacteria by ordinary germicidal agents has long been extremely difficult without objectionable effects on the air itself. Now we have ultra-violet radiation of germicidal wavelength (2537-A) which is an inherently powerful agent for the efficient destruction of air-borne bacteria. It can be introduced into any room without any change in comfort conditions of that room; the rays are practically unabsorbed by air and have **no** effect on it. They travel until intercepted by a wall or other absorbing medium, their effectiveness limited solely by the density of the bacteria.



## Automatic Light Control



### PROVIDES

- (1) Automatic means for turning on lights when natural lighting is inadequate.
- (2) Efficient working conditions by maintaining the desired level of illumination.
- (3) Protection against nervous muscular fatigue.
- (4) Correct control for the best utilization of lighting.
- (5) Freedom from attention to lighting.
- (6) Protection to eyes, helping to prevent eye injury.



## Two Types of Automatic Light Controls

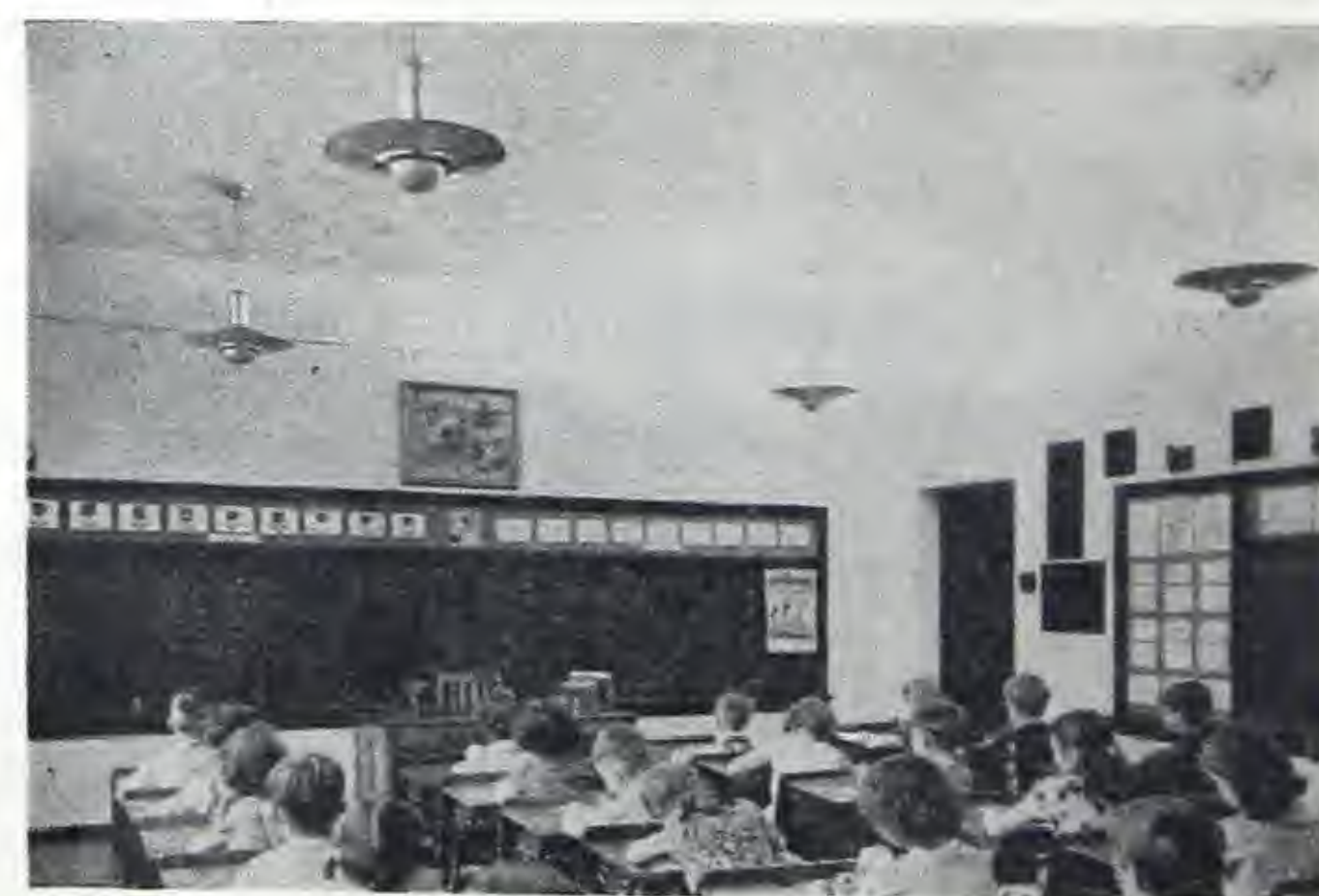
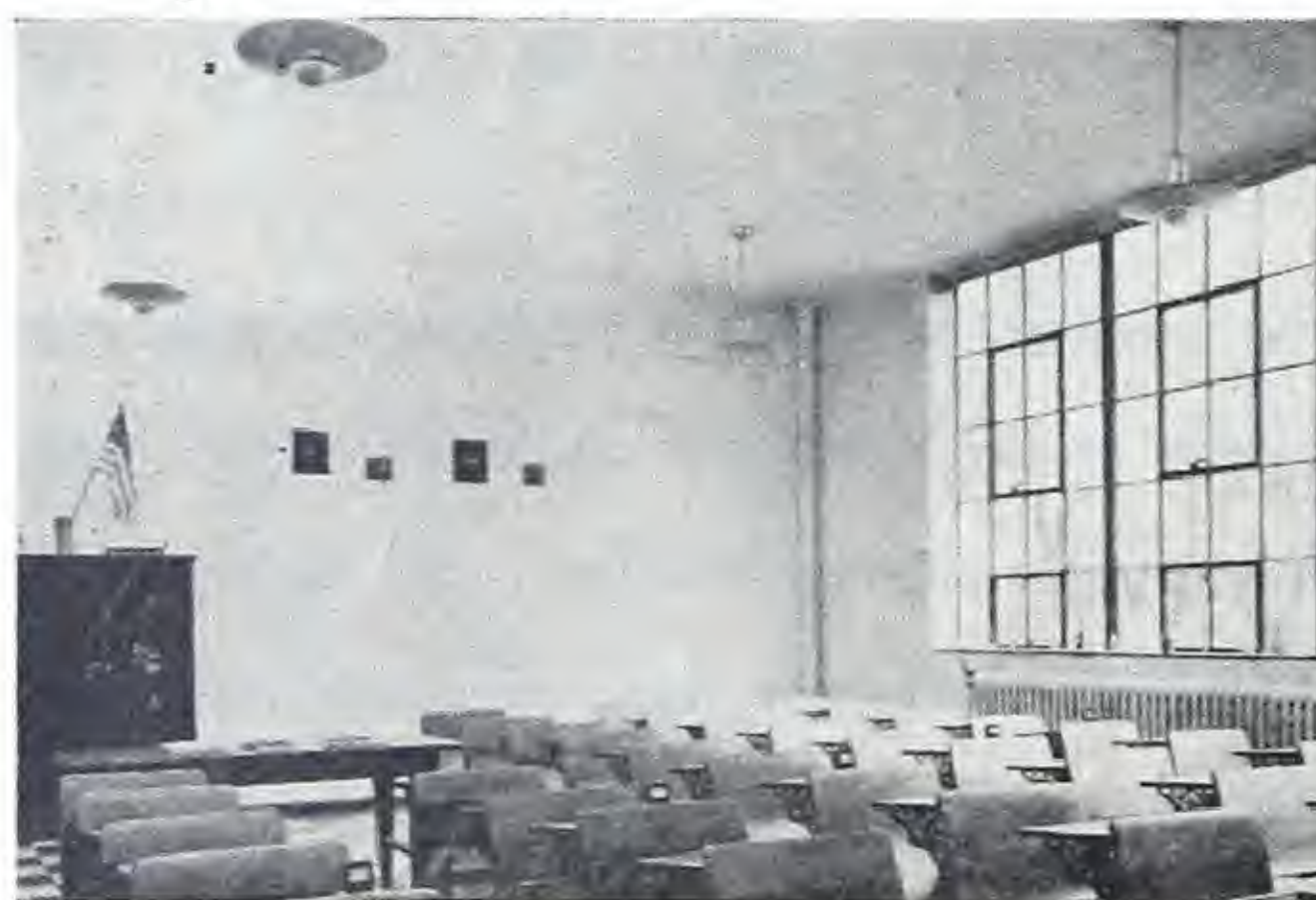
Natural lighting is subject to gradual variation throughout the day and no individual can in practice be relied upon to determine by visual observation when more light should be added to a room or when artificial light can be spared.

Automatic Light Control units have been specially developed to make installation easy and at a reasonable total installed cost. Adaptable for either existing lighting conditions or new jobs.

The device will turn on the additional classroom lighting when the natural illumination at a given point in the room falls below a predetermined value. If the daylight illumination then increases sufficiently, the unit will turn off the lights.

The control unit is small and compact and almost unnoticeable when mounted on the wall of a room.

The Automatic Light Control does not lag behind nor make mistakes. It assures good seeing conditions at all times with a minimum expenditure of electricity.



# Northern Electric

COMPANY LIMITED

HALIFAX SAINT JOHN, N.B. QUEBEC TROIS RIVIERES SHERBROOKE MONTREAL OTTAWA VAL D'OR  
TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY PORT ARTHUR  
WINNIPEG REGINA CALGARY EDMONTON VERNON VANCOUVER VICTORIA





July, 1945

L-0-6

NOR-ELECTRIC



BULLETIN



## Hospital Lighting

Where So Much  
Depends On Light  
There Should Be  
No Compromise  
With Efficiency

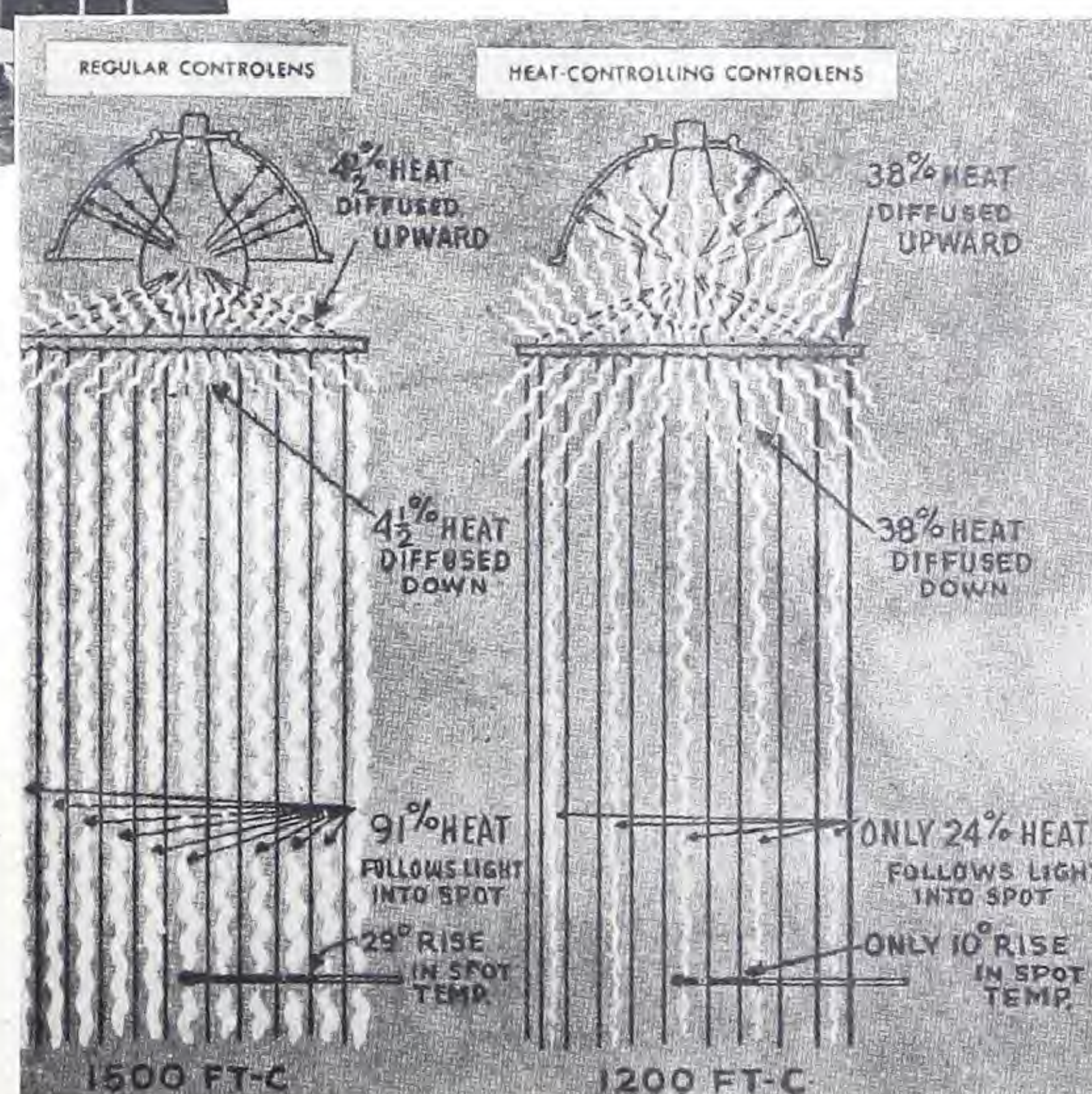
!

"HI-STRESS"

## Heat-Controlling Controlens

... For CONCENTRATED LIGHT

... For DISSIPATED HEAT







Multiple Spot Lens System Flush

## MULTIPLE SPOT LENS SYSTEM

Based on the latest optical, visual and physiological advancements, the M.S.L.S. provides modern surgery lighting at the lowest cost. It produces an over-size spot lighted area of the necessary brightness and balanced illumination for the entire operating theatre. It requires no handling by the surgeon. It is the basic lighting equipment needed in every operating room. M.S.L.S. installations have totalled several hundred in a single year.

## ADVANTAGES OF MULTIPLE SPOT LENS SYSTEM

**EFFICIENT LIGHTING**—Ceiling locations of units eliminates obstruction in operating zone. Gives surgeon full freedom of movement.

**SAFE LIGHTING**—"Hi-Stress" Controlenses resist breakage. Multiple lamping insures bright spot at all times. Freedom from explosion hazard owing to ceiling location.

**COMFORTABLE LIGHTING**—Heat controlling Controlenses reduce discomfort. Quantity and distribution of light ensures visual comfort and reduces fatigue.

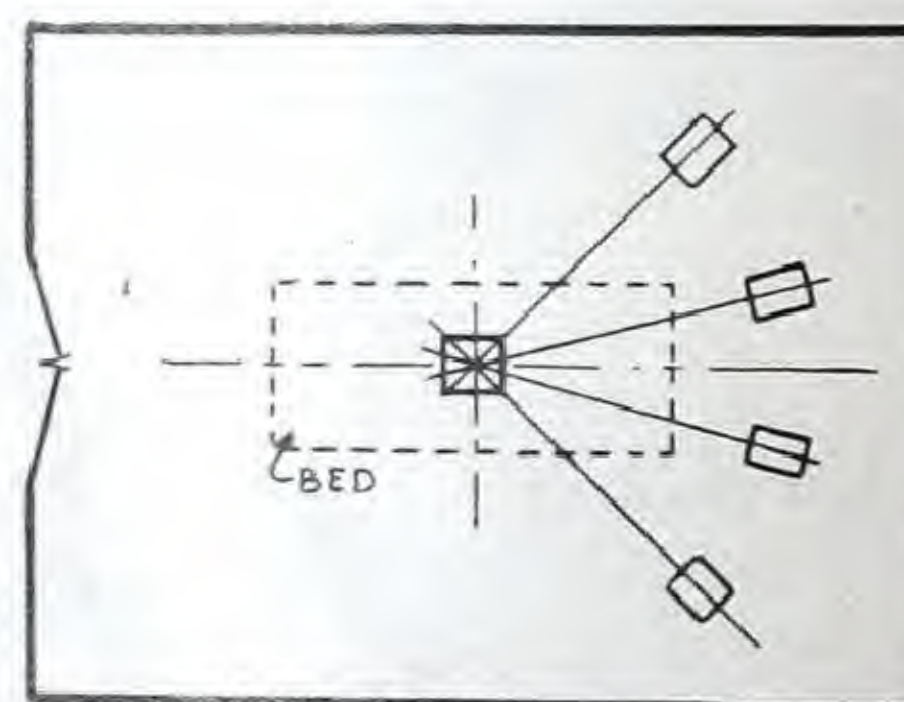
**PERMANENT LIGHTING**—M.S.L.S. is not subject to deterioration.

## DELIVERY ROOM

Delivery rooms require special lighting. Adequate illumination of the process of birth is conceivably the most important matter in the whole field of illumination. A special arrangement of ceiling spots is desirable.



Multiple Spot Lens System Exposed



Left: Plan showing typical arrangement of Lens Units for Delivery Room.







M.C.L.S. Flush Installation—The Infirmary—Halifax, N.S.

*Presenting*  
**"Hi-Stress"**  
*Heat Controlling Controlenses*

... For CONCENTRATED LIGHT  
 ... For DISSIPATED HEAT

Since 1898 systems of illuminating surgeries developed by Holophane engineers, have been recognized by authorities as the most effective permanent lighting for this specialized purpose. Today in the new heat controlling Controlenses, they make another contribution to hospital efficiency.

- "In-Bilt" ceiling units take light sources out of the way; permit free movement.
- Lighting is safe, out of hazard zone.
- Provides correct visual conditions in surgery.
- Heat control aids comfort, reduces tension.
- "Hi-Stress" Controlenses resist breakage.

*Comfort*... To ensure comfort, the Holophane Co. has developed a new glass which has the property of preventing the direct heat radiation of the lamp from concentrating at the spot. Controlenses made of this glass produce a cool spot. All surgical lighting equipment is now supplied with these new Controlenses.

*Safety*... The new Controlenses for surgical lighting are not only heat-correcting but in addition are made of "Hi-Stress" glass and will not break in any circumstances of ordinary usage—during shipment, installation or maintenance.

When plans are being drawn have your engineer or architect consult the Northern Electric Specialists for information on the special lighting and electrical equipment for hospitals.



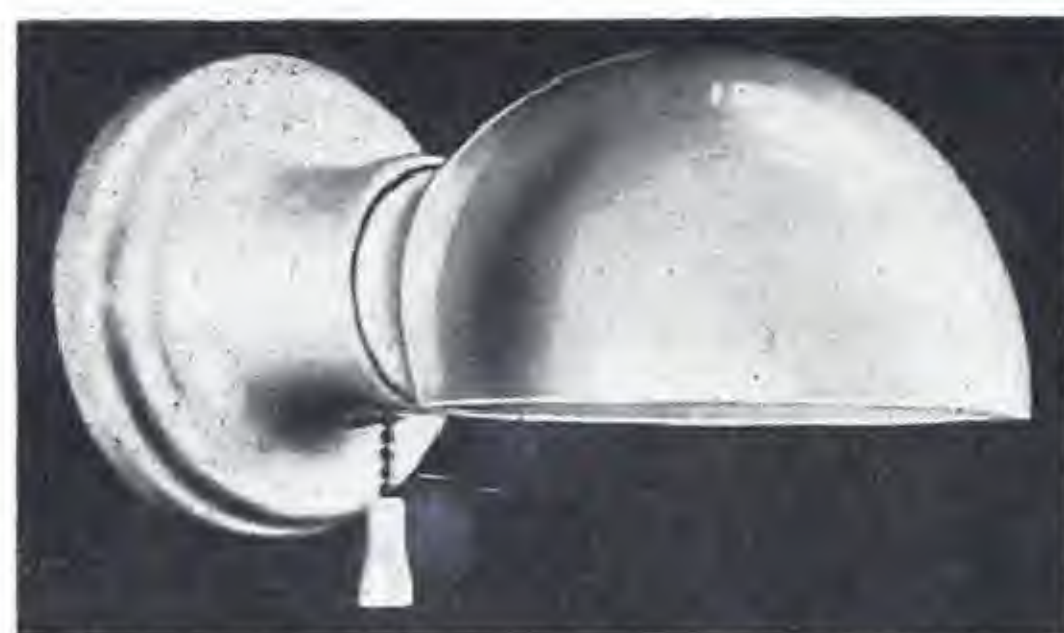


### PORCELAIN ENAMELED FLANGES

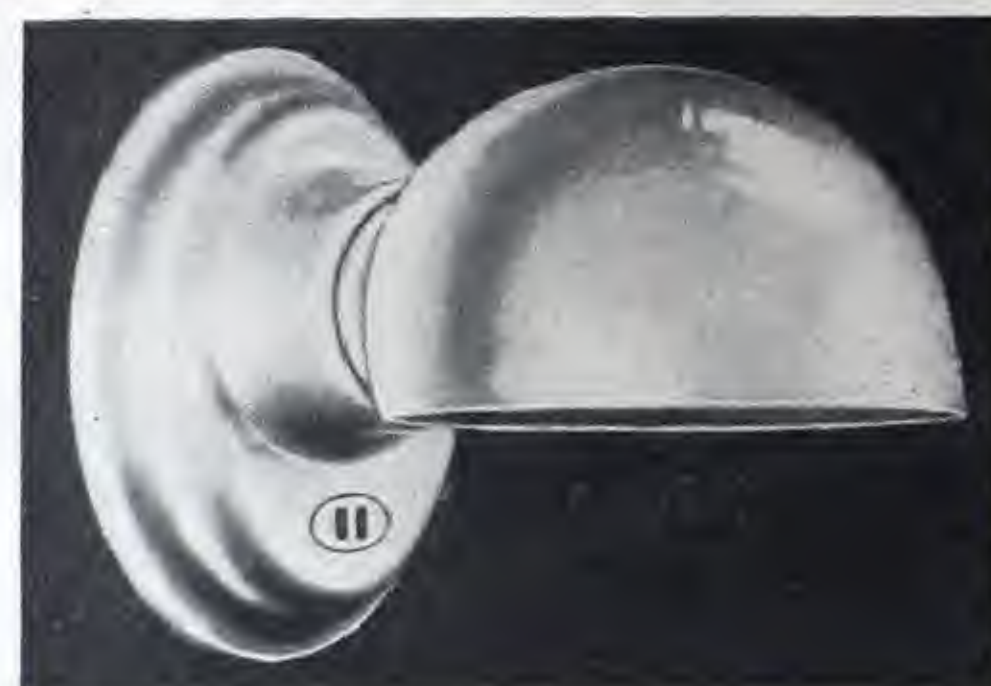
The vitreous porcelain finish is everlasting and is especially desirable where cleanliness and sanitation are paramount, as this hard finish is unaffected by daily scrubbing. Also used in atmospheres where acids are present. This flange has a self-adjusting patented glass-holder; is rust-proof and non-vibrating.

### *Aglites*

### FOR BATHROOMS, CLOSETS, HALLS, ETC.



These are high-quality utility units. Formed of steel, finished White Porcelain Enamel. They are light-weight and easy to install.



### *Doctor's Office*

In the doctor's office general illumination is required as well as special illumination. The unit illustrated on the left gives an adequate amount of light from one, dirt-resisting, smooth, crystal sphere. This unit has two distinct optical systems: one for general illumination at all times, and one for special illumination when and as desired.





## *Lighting For The Wards*

The first requisite for good lighting is complete serenity. A variation of brightness in the field is disturbing to patients. This is glare. The Ainsworth Magna Luminaire is designed to have a brightness equal to the ceiling brightness. This system of lighting creates a wide and even radiation overhead, thus diffusing light evenly about the whole area.

The low brightness on the lower surface of the luminaire glass reflector conforms to the general brightness of the ceiling. It also avoids appearance of excessive ceiling brightness caused by opaque metal reflectors which are silhouetted against lighted ceilings. Patients are relaxed and more tranquil.

### *Private and Semi-Private Rooms*

Ceiling lights such as illustrated on the right are used predominantly because they are satisfactory and represent the least expensive way to light the whole sick room with reasonable formity. They have an advantage in that there is no objectionable glare in the patients' eyes.





## Germicidal Layouts and Recommendations

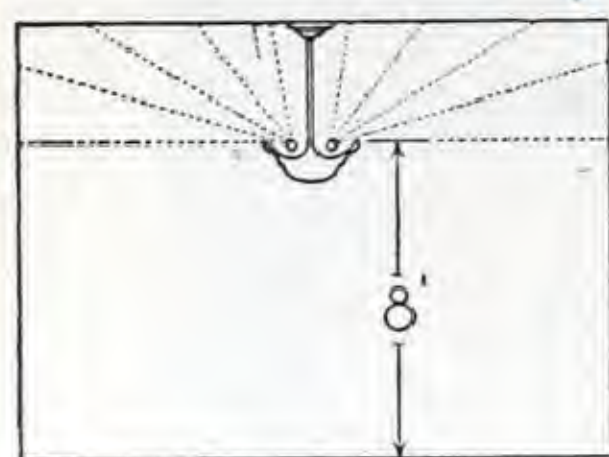


Figure 1

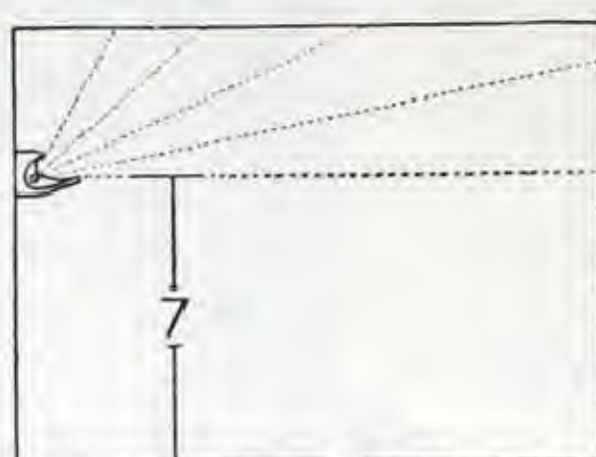


Figure 2

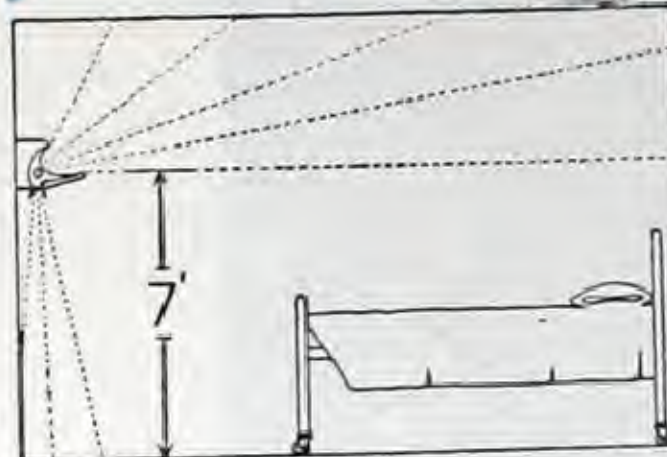


Figure 3

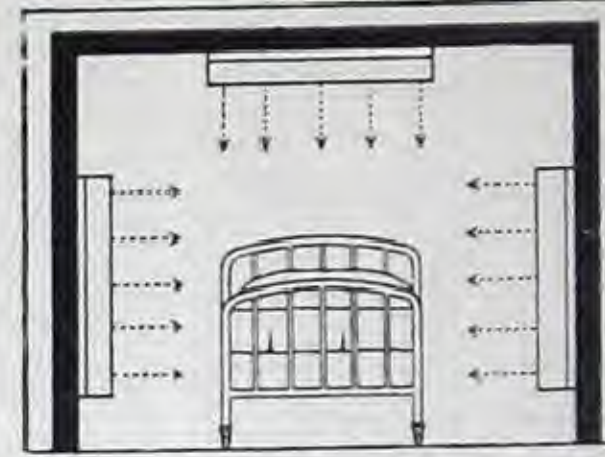


Figure 4

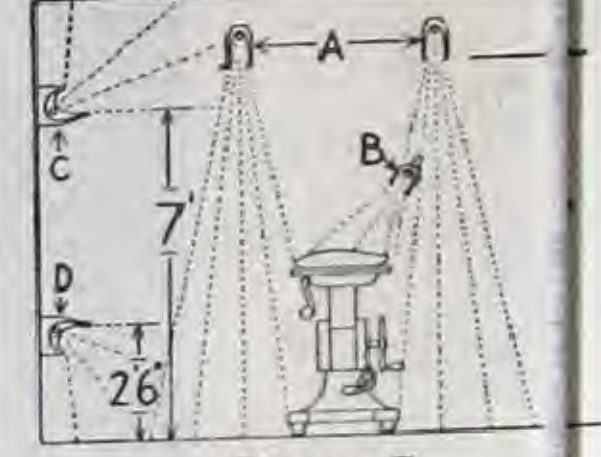


Figure 5

**Methods of Installation:** Above diagrams illustrate five typical types of Germicidal installations. Several suggestions for the various types are made in layouts on this page. Fixture units are recommended and shown on page 7.

**How to Arrange:** The term used in calculating Germicidal installations is "Air-Changes-Per-Hour" meaning the equivalent number of displacements-per-hour of room-air by fresh-air needed to secure a given disposal of the bacteria.

Air contamination varies usually proportionately to occupancy and upon susceptibility of the occupants. The following table gives quick estimates in square-foot area per lamps for bactericidal treatment of air under three type room conditions. "A" figures (in table) give approximately 100 air-changes-per-hour and are recommended for private rooms, lecture rooms, etc. "B" figures provide about 200 air-changes-per-hour and are suggested for wards, laboratories, etc. Type "C" figures render approximately 300 air-changes-per-hour and are for infant nurseries, hospital baby-wards and operating-rooms.

**LAYOUT TABLE**

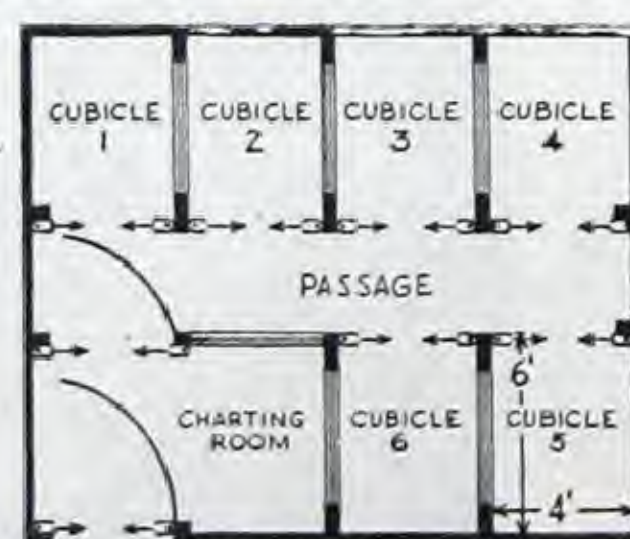
Ceiling Height	FLOOR AREA IN SQUARE FEET					
	For 15-Watt Unit			For 30-Watt Unit		
	A	B	C	A	B	C
8' 0"	120	60	30	300	150	100
10' 0"	150	75	40	375	185	125
12' 0"	180	90	45	450	225	150
14' 0"	210	105	55	525	260	175

**Baby Cubicles:** To reduce the spread of cross-infections in contagious disease baby-wards, many experiments and tests have already been conducted and with highly satisfactory results. A general floor-plan for an effective installation is shown below with further details below. Test results from this type of installation show that very few organisms pass from one cubicle to another.

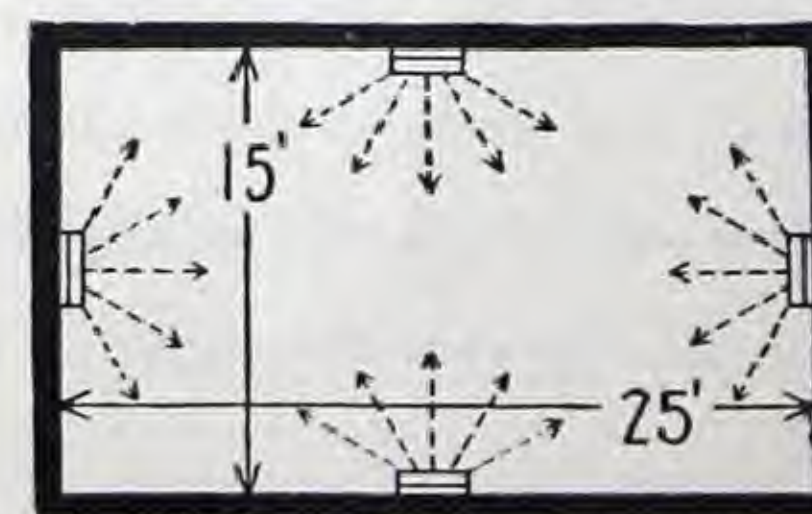
Six individual cubicles and a charting room are shown. At the entrance to each cubicle and at the room entrances, 6 15-watt Germicidal lamp units were installed. See Figure 4, above, for vertical cross-section of entrances. Partitions were installed above each entrance as well as full-side partitions, and all extended to the ceiling. Shorter partitions and fewer lamps were less effective. The efficiency of the lamps was found satisfactory when no forced air-circulation was used or when air was changed 4, 6, or 9 times per hour. At the back of the cubicle where the baby's cot was placed, there was such a small amount of ultra-violet that it could not be measured.

An elliptical ALZAK aluminum reflector was used behind each lamp. Reflector-housing covered the lamps to a 4" depth; sides of the housing (inside) were finished black to prevent emission of stray rays. Aperture of housing was but 1½" wide to prevent burning of the nurses' skin. "Barrier Type" units are constructed with these identical refinements.

Specific recommendations for this type installation are two "Barrier Type" units mounted at top and on both sides of each entrance. This unit can be mounted horizontally or vertically and from their top or sides; also can be butted end-to-end if



Baby Cubicles



Laboratory

desired. These units are nicely finished for exposed mounting; however, can also be mounted behind a recess where desired.

**Infant Wards:** In large areas where numerous healthy babies are bedded, use "Air-Displacement Table." For an example, let us take a room 30' x 30' with a 12' ceiling-height. From column "C" figures in table, we find that 6 30-watt lamps, or 16 15-watt lamps should be used to effect approximately 300 Air-Changes-Per-Hour. Therefore, three centrally located Indirect Units can be ceiling-mounted 8' from floor (see Figure 1 above) or six Bracket Type units can be mounted on the side-walls, 7' 0" above floor-level (see Figure 2 above).

**Private Rooms:** Use "A" column figures in "Air-Displacement Table." For an example, let us take a room 12' x 15' with a 12' ceiling. From the table, we find that 1 15-watt lamp unit will be effective. Two types of the same Bracket Type unit can be used—the totally indirect or the direct-indirect. If the direct-indirect unit is installed, same should be mounted directly over the room-entrance; a vertical "barrier" screens the entrance and outward and upward rays provide an overhead reservoir of sterile air.

**Wards:** Using "B" column figures in table (approx. 200 air-changes-per-hour), we find that for a typical ward 25' x 30' with a 12' ceiling, there should be installed 8 15-watt or 4 30-watt lamp units. Several suggestions are offered. Four Centrally Located Indirects (12' x 15' spacings) can be suspended from the ceiling. Or four Bracket Type units can be mounted on the side-walls. Where it is desirable to divide the ward into compartments, Barrier Type units can be used. These, to supplement the above suggested units, not to supersede same.

**Operating Rooms:** Recent tabulations prove almost entire elimination of severe post-operative infections by proper installation of Germicidal lamps in the operating room. The well-balanced installation for modern operating rooms is accomplished by overhead and floor-level reservoirs of sterile air (provided by fixtures "C" and "D" in Figure 5, above) combined with a downward barrier (fixtures "A" in Figure 5) and finally the direct-irradiator (fixture "B" in Figure 5) focused on the seat of the operation.

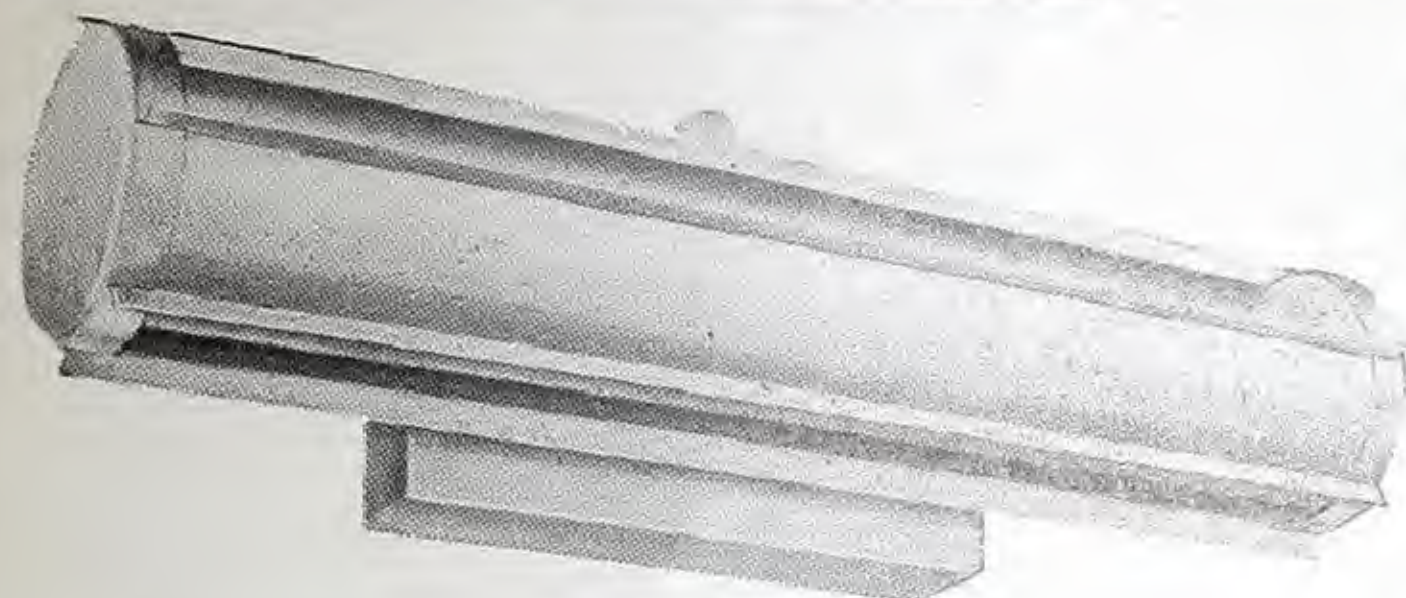
Fixtures "C" and "D" in Figure 5 are Bracket Types. Unit "D" is mounted in an inverted position. In an 18' x 20' operating room with a 12' ceiling, eight Bracket Type units are recommended; four of them (one on each wall) mounted as "C" in Figure 5, 7' 0" above floor-level. The other four are mounted as "D" in Figure 5 (one on each of the four walls) and to be 30" above the floor. These eight units will provide approximately 300 air-changes-per-hour (see "Air-Displacement Table" using "C" column figures). These units will provide continual irradiation on most of the vertical, on all of the horizontal room surfaces and on much of the circulating-air in the room.

**Laboratories:** A foremost use of the Germicidal Lamp is in the hospital laboratory. Bacteria germs are the very subject of work in these areas. To minimize their prevalence in the room air-currents, Germicidal lamps are very effective. Below is shown a typical laboratory, size 15' x 25' with a 12' ceiling. Use "B" figures in "Air-Displacement Table." Four Bracket Type units, one on each wall, can be used; or two on opposite walls of the 25' length could be used efficiently.

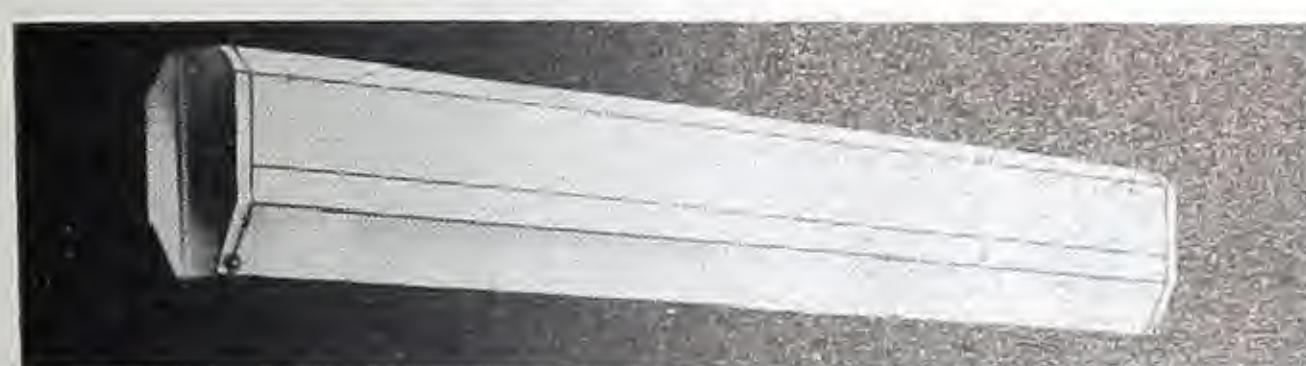




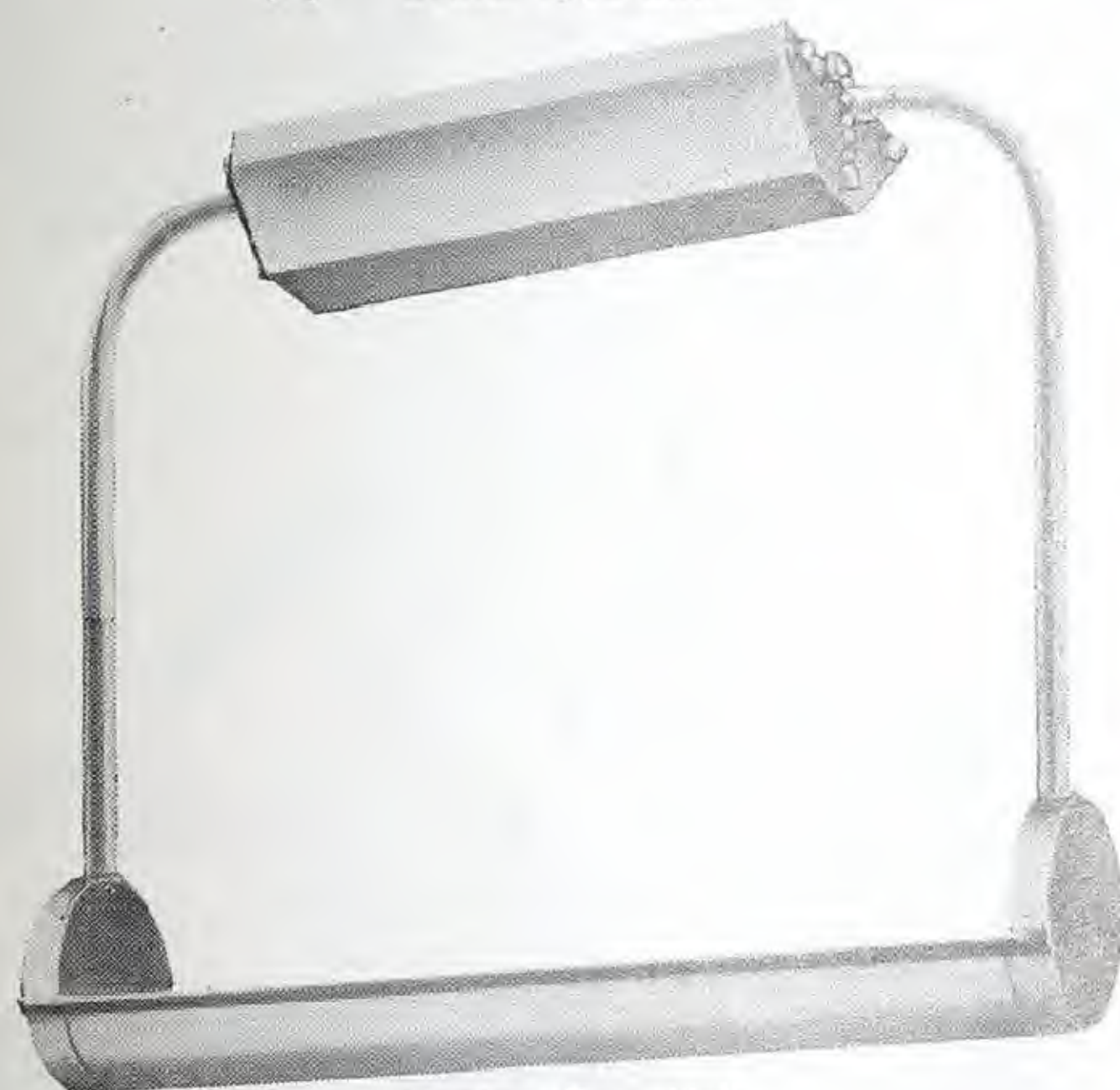
Bracket Type Unit



Bracket Type Unit



Barrier Type Unit



Pendant Type Unit



Deep Reflector Unit

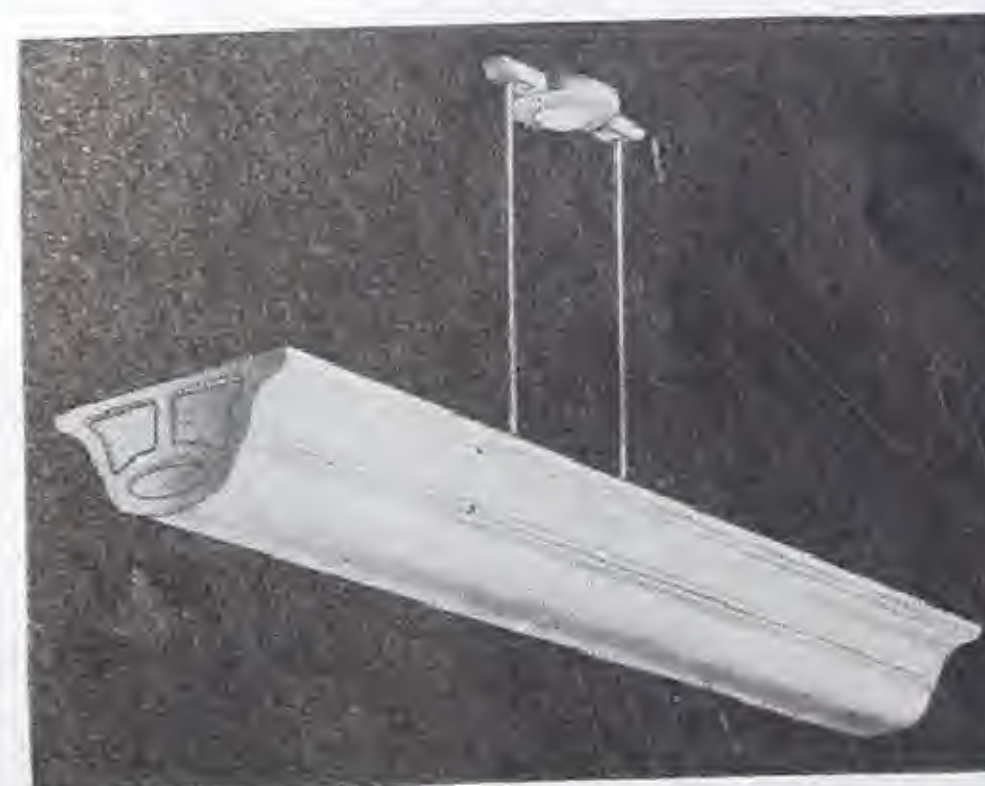
## GERMICIDAL UNITS

Germicidal lamps emit the shorter wave-length (2537A) of ultra-violet which kill air-carried bacteria. Air-carried bacteria results from evaporation of minute droplets expelled in respiratory process; this enables infection to ride on the air currents in the room. Ultra-violet reaches these germs like "a charge of shot into a flock of birds in flight." It is the simplest, most efficient method of killing air-carried bacteria, and is limited solely by the distribution of the energy in the air and by the distance it can travel before being intercepted by a wall. Ozone concentration by Germicidal lamps is within limits defined by the American Medical Association, when properly installed.

**Hospital Uses:** In the operating room, severe post-operative infections can be almost entirely eliminated. In wards and in the nursery "vertical barriers" of Germicidal rays divide large areas into compartments, themselves free of erythema producing radiation, but each entirely isolated bacteriologically on the side, and with an overhead reservoir of sterile air. In hospital laboratories, where bacteria itself is the work involved, workers are protected by Germicidal lamp installations.

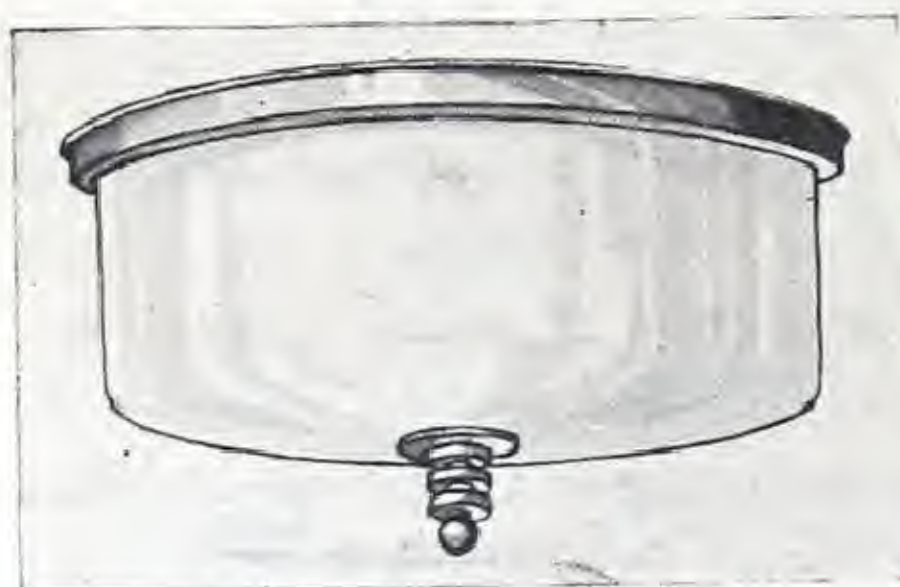
**Powerful:** Germicidal lamps are very powerful and can produce effects similar to sunburn on the skin. Direct viewing of the lamp is irritating to the eyes. Close, direct irradiation on wallpaper and paint will cause bleaching. For these reasons, fixture design and mounting arrangements are an exacting art if best utilization and complete comfort are to be gained.

**Maintenance:** It is essential to keep lamps and reflectors clean. Slight films of dust or grease materially reduce Germicidal output. A regular cleaning schedule should be set up.



Indirect Unit





### CORRIDORS, STAIRWAYS, ETC.

In places such as this an illumination of at least 4 foot-candles is suggested. Enclosing general diffusing or some indirect units are most suitable although small indirect or semi-indirect luminaires may often be used to advantage in corridors and entrance lobbies. In the case of stairways an overhead lighting unit should be provided at each landing. Small wall type units at stairways and landings are directly in the line of vision and often make it difficult to see the steps clearly.



### NIGHT LIGHTS

Much thought must be given this subject. It is not only essential to provide good night illumination for all main aisles in wards and for the private rooms, but it is of utmost importance that due care be given to proper spacing of the light units to eliminate bad contrast and harsh shadows. It is these shadows that tend to make it difficult for the patient to sleep. A fixture placed flush to the wall, near the floor, under the bed or by the head of it, will supply enough illumination for the medical attendants to perform their duties and is sufficient to prevent stumbling around and disturbing the patients during necessary night inspections.



### BED LAMPS

General illumination in the wards is not sufficient for comfortable reading and so a bed light should be provided for each bed. This type of lamp is both practical and inexpensive. It stands upright, clamps to a rail or is able to hang.



### EXIT LIGHTS

Either of these two types of Exit lights are recommended for use in Hospital lighting. The unit illustrated on the left can be mounted at the top, back, bottom, or either end. The lettering is black on a red background. The second unit is a glass cube with lettering on three sides. White letters on a red background.



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WINNIPEG REGINA CALGARY EDMONTON VERNON VANCOUVER VICTORIA









# NOTICE

With this issue of its Lamp Price List, the Canadian General Electric Co. introduces a system of Lamp Ordering Abbreviations which it is felt will simplify considerably the ordering of lamps and reporting of consignment stocks. We solicit the cooperation of our customers in using these Lamp Ordering Abbreviations wherever possible, as explained under the following caption:

## HOW TO ORDER LAMPS

Quantity desired of each type of lamp should be specified. Lamps should be ordered by the Lamp Ordering Abbreviation provided in the schedule for each type. Each abbreviation is complete for ordering without any other specifications, **except that the voltage required must be specified as well.** Abbreviations which are complete without voltage include Fluorescent and Series lamps.

Further simplification in ordering is possible by grouping together items having the same required voltage under one voltage heading, making it unnecessary to repeat the voltage opposite each item.

## TRANSPORTATION ALLOWANCE AND CHARGES TO AGENTS OR PURCHASERS

### Large Style General Electric Lamps

1. Shipments of all lamps listed in price schedule may be made to agents' consignment stocks, freight prepaid on exclusive shipments of General Electric lamps to all points in Canada.
2. On shipments of all lamps listed in price schedules sold and billed to purchasers, freight may be prepaid only where such shipments consist of not less than one standard package.
3. Shipments to purchasers of less than one standard package will be made collect.
4. When lamps are shipped by express, an allowance equal to the total of the freight payable on the same shipment may be allowed.



Watts	Volts	Bulb	Base	Finish, Description, etc.	Lamp Ordering Abbreviation (Except Volts)	List Price	Std. Pkg. Qty.	Rated Initial Lumens	Max. Over-all Length (Ins.)	Average Light Centre Length (Ins.)	Position of Burning
GENERAL ELECTRIC LAMPS FOR 110, 115 AND 120 VOLT CIRCUITS											
6	110, 115, 120	S-6	Cand.	Clear.....	6S6	\$.20	100	40	1 7/8	1 5/16	Any
7	120 (only)	C-7	Cand.	Clear.....	7C7	.15	100	50	2 1/8	.....	Any
				Out. Col. White.....	7C7/W	.15	.....	.....	.....	.....	Any
				Red.....	7C7/R	.15	.....	.....	.....	.....	Any
10	110, 115, 120	S-11	Int.	Clear.....	10S11N	.21	120	79	2 5/16	1 5/8	Any
				I. F.....	10S11N/IF	.21	.....	.....	.....	.....	Any
				Ins. Col. Red.....	10S11N/R	.28	.....	.....	.....	.....	Any
				Blue.....	10S11N/B	.28	.....	.....	.....	.....	Any
				Green.....	10S11N/G	.28	.....	.....	.....	.....	Any
				Yellow.....	10S11N/Y	.28	.....	.....	.....	.....	Any
				Amber-Orange.....	10S11N/AO	.28	.....	.....	.....	.....	Any
				Flametint.....	10S11N/FT	.28	.....	.....	.....	.....	Any
				White.....	10S11N/W	.28	.....	.....	.....	.....	Any
	110-115, 115-120	S-14	Med.	Clear.....	10S14	.20	.....	79	3 1/2	2 1/2	Any
				I. F.....	10S14/IF	.20	.....	.....	.....	.....	Any
				Ins. Col. Red.....	10S14/R	.27	.....	.....	.....	.....	Any
				Blue.....	10S14/B	.27	.....	.....	.....	.....	Any
				Green.....	10S14/G	.27	.....	.....	.....	.....	Any
				Yellow.....	10S14/Y	.27	.....	.....	.....	.....	Any
				Amber-Orange.....	10S14/AO	.27	.....	.....	.....	.....	Any
				Flametint.....	10S14/FT	.27	.....	.....	.....	.....	Any
				White.....	10S14/W	.27	.....	.....	.....	.....	Any
15	110-115, 115-120 120 (only)	A-15 F-10	Med. Cand.	I. F.....	15A15	.15	120	135	3 1/2	2 3/8	Any
				Out. Col. Flametint.....	15FC/FT	.28	60	.....	3 1/16	1 5/8	Any
				Ivory.....	15FC/V	.28	.....	.....	.....	.....	Any
				White.....	15FC/W	.28	.....	.....	.....	.....	Any
	110, 115, 120	T-7	D.C. Bay Cand. Int.	I. F. Home Appliance.....	15T7/2DC	.35	100	107	2 5/8	1 5/16	Any
					15T7C/IF	.40	.....	.....	.....	1 1/2	Any
					15T7N/IF	.40	.....	.....	.....	1 1/16	Any
25	110-115, 115-120	A-19	Med.	I. F.....	25A	.15	120	260	3 13/16	2 1/2	Any
				Clear Milltype.....	C25A/MT	.30	.....	235	.....	.....	Any
				Ins. Col. Red.....	25A/R	.27	.....	.....	.....	.....	Any
				Blue.....	25A/B	.27	.....	.....	.....	.....	Any
				Green.....	25A/G	.27	.....	.....	.....	.....	Any
				Yellow.....	25A/Y	.27	.....	.....	.....	.....	Any
				Amber-Orange.....	25A/AO	.27	.....	.....	.....	.....	Any
				Flametint.....	25A/FT	.27	.....	.....	.....	.....	Any
				Ivory.....	25A/V	.27	.....	.....	.....	.....	Any
				Old Rose.....	25A/RO	.27	.....	.....	.....	.....	Any
				Out. Col. Red.....	25A/OR	.27	.....	.....	.....	.....	Any
				Blue.....	25A/OB	.27	.....	.....	.....	.....	Any
				Green.....	25A/OG	.27	.....	.....	.....	.....	Any
				Yellow.....	25A/OY	.27	.....	.....	.....	.....	Any
				Amber-Orange.....	25A/OAO	.27	.....	.....	.....	.....	Any
				Flametint.....	25A/OFT	.27	.....	.....	.....	.....	Any
				Ivory.....	25A/OV	.27	.....	.....	.....	.....	Any
				Old Rose.....	25A/ORO	.27	.....	.....	.....	.....	Any
	115-120 (only)	F-15		Daylight Clear.....	25A/D	.42	.....	170	.....	.....	Any
				Clear.....	25F	.22	.....	260	4 1/2	.....	Any
				Out. Frosted.....	25F/AF	.22	.....	.....	.....	.....	Any
				Out. Col. Flametint.....	25F/FT	.22	.....	.....	.....	.....	Any
				Ivory.....	25F/V	.22	.....	.....	.....	.....	Any
				Old Rose.....	25F/RO	.22	.....	.....	.....	.....	Any
				White.....	25F/W	.22	.....	.....	.....	.....	Any
	110, 115, 120	G-18 1/2	Int.	Out. Col. White.....	25G18 1/2/W	.40	.....	.....	3 3/16	2 1/4	Any
	110-115, 115-120	T-6 1/2		Clear Showcase.....	25T6 1/2	.50	60	235	5 1/2	.....	Any
		T-10	Med.	" " " " " " " "	25T10	.35	.....	.....	5 5/8	.....	Any
				I. F. " " " " " " " "	25T10/IF	.40	.....	.....	.....	.....	Any
				Light I. F. Reflector.....	25T10/RFL	.80	.....	.....	.....	.....	Any
30	120 (only)	T-8	Disc.	Ins. White Lumiline.....	L30/W	\$1.30	24	.....	17 3/4	.....	Any
40	110-115, 115-120	A-19 A-21	Med.	I. F.....	40A	.15	120	440	4 1/4	2 7/8	Any
				Ins. Col. Red.....	40A/R	.30	.....	.....	4 1/16	.....	Any
				Blue.....	40A/B	.30	.....	.....	.....	.....	Any
				Green.....	40A/G	.30	.....	.....	.....	.....	Any
				Yellow.....	40A/Y	.30	.....	.....	.....	.....	Any
				Amber-Orange.....	40A/AO	.30	.....	.....	.....	.....	Any
				Flametint.....	40A/FT	.30	.....	.....	.....	.....	Any
				Ivory.....	40A/V	.30	.....	.....	.....	.....	Any
				Old Rose.....	40A/RO	.30	.....	.....	.....	.....	Any
	115-120 (only)	G-25		Out. Col. White.....	40G/W	.50	60	.....	.....	2 3/4	Any
	110, 115, 120	T-8		Clear Showcase.....	40T8	1.20	24	410	11 7/8	.....	Any
	120 (only)		Disc.	Ins. White Lumiline.....	L40/W	1.20	.....	.....	11 3/4	.....	Any
	110, 115, 120	T-10	Med.	Light I. F. Reflector.....	40T10/RFL	.80	60	.....	5 5/8	.....	Any
40			3					412			
60	115-120 (only)	A-23	cont.	I. F. 3-Lite.....	C40/100	.50	.....	720	5 1/2	3 1/2	Any
100			Med.					1132			







Approx. Lamp Watts	Bulb	Nom. M.O.L. (Ins.)	Base	Color of Light Produced	Lamp Ordering Abbreviation	List Price	Std. Pkg. Qty.	Burning Hours Per Start	Rated Average Life	Approx. Initial Lumens
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### GENERAL ELECTRIC GENERAL LINE FLUORESCENT LAMPS†

6	T-5	9	Min. Bipin	4500 White..... Daylight..... 3500 White.....	F6T5 /45W F6T5 /D F6T5 /W	\$1.00 1.00 1.00	24	3	2500	198 186 210
8	T-5	12	Min. Bipin	4500 White..... Daylight..... 3500 White.....	F8T5 /45W F8T5 /D F8T5 /W	1.20 1.20 1.20	24	3	2500	310 295 330
13	T-5	21	Min. Bipin	4500 White.....	F13T5 /45W	1.25	21	3		545
14	T-12	15	Med. Bipin	4500 White..... 3500 White.....	F14T12 /45W F14T12 /W	1.00 1.00	24	3	2500	460 490
15	T-8	18	Med. Bipin	4500 White..... Daylight..... 3500 White.....	F15T8 /45W F15T8 /D F15T8 /W	.80 .80 .80	24	3 6 12	2500 4000 6000	600 585 615
15	T-12	18	Med. Bipin	4500 White..... Daylight..... 3500 White.....	F15T12 /45W F15T12 /D F15T12 /W	1.00 1.00 1.00	24	3 6 12	2500 4000 6000	570 540 600
*20	T-12	24	Med. Bipin	4500 White..... Daylight..... 3500 White.....	F20T12 /45W F20T12 /D F20T12 /W	1.00 1.00 1.00	24	3 6 12	2500 4000 6000	860 800 920
30	T-8	36	Med. Bipin	4500 White..... Daylight..... 3500 White.....	F30T8 /45W F30T8 /D F30T8 /W	1.00 1.00 1.00	24	3 6 12	2500 4000 6000	1380 1350 1470
40	T-12	48	Med. Bipin	4500 White..... Daylight..... 3500 White..... 4500 White—instant start—high humidity.....	F40T12 /45W F40T12 /D F40T12 /W F40T12 /45W /IS /H	1.30 1.30 1.30 1.65	24	3 6 12	2500 4000 6000	2100 1920 2300 2100
100	T-17	60	Mog. Bipin	4500 White..... Daylight..... 3500 White.....	F100T17 /45W F100T17 /D F100T17 /W	3.20 3.20 3.20	12	3 6 12	3000 4500 6500	4000 3900 4200

†Soft White (F15T8/SW)...\$0.95 Blue (F15T8/B), Green (F15T8/G) and Pink (F15T8/PK)...\$1.05 Gold (F15T8/GO) and Red (F15T8/R)...\$1.20  
 \* " " (F20T12/SW)...1.15 " (F20T12/B), " (F20T12/G) " " (F20T12/PK)...1.25 " (F20T12/GO) " " (F20T12/R)...1.40  
 † " " (F30T8/SW)...1.15 " (F30T8/B), " (F30T8/G) " " (F30T8/PK)...1.25 " (F30T8/GO) " " (F30T8/R)...1.40  
 § " " (F40T12/SW)...1.55 " (F40T12/B), " (F40T12/G) " " (F40T12/PK)...1.70 " (F40T12/GO) " " (F40T12/R)...1.85

†When lamps are required for 25 cycle operation, order should so specify.

### GENERAL ELECTRIC SLIMLINE LAMPS

16 25	T-6	42	Single Pin	4500 White.....	F42T6 /45W	2.20	24			880 1320
24 39	T-6	64	Single Pin	4500 White.....	F64T6 /45W	2.45	24	3 6	2500 4000	1370 2150
22 38	T-8	72	Single Pin	4500 White.....	F72T8 /45W	2.80	12	12	6000	1340 2250
29 51	T-8	96	Single Pin	4500 White.....	F96T8 /45W	3.80	12			1800 3050

### GENERAL ELECTRIC CIRCLINE LAMPS

32	T-10	12 Outside Diam.	4 Pin	3500 White.....	FC12T10 /W	2.45	12	3	2500	1600
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### GENERAL ELECTRIC GERMICIDAL LAMPS

15	T-8	18	Med. Bipin	.....	G15T8	6.30	24		*2500	
30	T-8	36	Med. Bipin	.....	G30T8	9.45	24		*2500	

\* Where Lamps are burned continuously (essentially without current interruption), the rated life is 4000 total burning hours.  
 ALL G-E FLUORESCENT AND GERMICIDAL LAMPS SHOULD BE USED ONLY WITH AUXILIARY EQUIPMENT DESIGNED TO PRODUCE  
 PROPER ELECTRICAL VALUES. LAMPS MAY BE BURNED IN ANY POSITION.

Watts	Bulb	Base	Finish, Description, etc.	Lamp Ordering Abbreviation (Except Volts)	List Price	Std. Pkg. Qty.	Max. Over-all Length (Ins.)	Approx. Initial Zone Lumens	Initial Max. Beam C.P.#
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### GENERAL ELECTRIC PROJECTOR AND REFLECTOR LAMPS—110, 115 AND 120 VOLTS (Lamps may be burned in any position)

150	PAR-38§	Med. Skt.†	Projector Spot..... Flood.....	150PAR /SP 150PAR /FL	\$1.95 1.95	12	5 1/16	990 (0-15°) 1150 (0-30°)	10,500 2,500
	R-40+	Med.	Light I. F. Reflector Spot..... I. F. Reflector Flood.....	150R /SP 150R /FL	1.35 1.35	24	6 1/2	700 (0-15°) 700 (0-30°)	7,000 1,200
300	R-40+	Med.	Light I. F. Reflector Spot..... I. F. Reflector Flood.....	300R /SP 300R /FL	2.00 2.00	24	6 1/2	1460 (0-15°) 1620 (0-30°)	16,000 3,000

†Should be burned only in porcelain sockets. †For satisfactory performance, no accessory equipment should be attached to, or touch, the glass bulb.  
 §Heat-resisting glass bulb—for outdoor or indoor use. \*At distance of 10 feet.



Watts	Volts	Bulb	Base	Finish, Description, etc.	Lamp Ordering Abbreviation (Except Volts)	List Price	Std. Pkg. Qty.	Rated Initial Lumens	Max. Over-all Length (Ins.)	Aver. Light Centre Length (Ins.)	Position of Burning
GENERAL ELECTRIC LAMPS FOR PROJECTION AND STEREOPTICON SERVICE											
100	110, 115, 120	T-8	S.C. Bay	Clear—CC-2V fil. ....	100T8/103SC	\$ .75	24	1920	3 $\frac{1}{8}$	1 $\frac{3}{8}$	Base Down or can be burned within 25 degrees of vertically base down without materially affecting per- formance
150	110, 115, 120	T-8	S.C. Bay	Clear.....	150T8/70	1.80	24	3300	3 $\frac{5}{8}$	1 $\frac{3}{8}$	
+200	110, 115, 120	T-8 T-10#	S.C. Bay Med. Pref.	Clear.....	200T8/SC 200T10P	1.85 2.95	24	4700 4250	3 $\frac{5}{8}$ 5 $\frac{3}{4}$	1 $\frac{3}{8}$ 2 $\frac{3}{16}$	
+300	110, 115, 120	T-10#	Med. Pref.	Clear (opaque end)—2CC-8 fil..	300 T10P	3.75	24	7200	5 $\frac{3}{4}$	2 $\frac{3}{16}$	
+500	110, 115, 120	T-10# T-20#	Med. Pref.	Clear (opaque end)..... Clear.....	500T10P 500T20P	4.90 3.05	24 6	13200 12,750	5 $\frac{3}{4}$	2 $\frac{3}{16}$	
+750	110, 115, 120	T-12#	Med. Pref.	Clear (opaque end).....	750T12P	5.75	24	20,250	5 $\frac{3}{4}$	2 $\frac{3}{16}$	
+1000 +	110, 115, 120	T-12# # T-20#	Med. Pref. # Mog. Pref.	Clear (opaque end)—10 hr. life 25 hr. life... Clear—C-13 fil.....	1M/T12P 1M/T12/46 1M/T20P	8.40 8.75 6.65	24 # 6	32,000 27,600 27,000	5 $\frac{3}{4}$ # 9 $\frac{1}{2}$	2 $\frac{3}{16}$ # 3 $\frac{7}{16}$	
*Should be used only in equipment that provides adequate forced cooling. #Heat-resisting glass bulb.											
GENERAL ELECTRIC LAMPS FOR SPOTLIGHT AND FLOODLIGHT SERVICE											
100	110, 115, 120	P-25	Med. Med. Pref.	Spot..... .....	100P25SP 100P25/PSP	\$1.10 1.30	60	1360	4 $\frac{3}{4}$ 5	3 2 $\frac{3}{16}$	Any position from vertically base down to hori- zontal
250	110, 115, 120	G-3C	Med. Med. Pref.	Spot..... Flood..... Spot.....	250G/SP 250G/FL 250G/PSP	1.60 1.60 1.95	24	4400 3850 4400	5 $\frac{1}{8}$ # 5 $\frac{3}{8}$	3 # 2 $\frac{3}{16}$	
400	110, 115, 120	G-3C	Med. Med. Pref.	Spot.....	400G/SP 400G/PSP	2.45 2.80	24	8000	5 $\frac{1}{8}$ 5 $\frac{3}{8}$	3 2 $\frac{3}{16}$	
500	110, 115, 120	G-40	Mog.	Flood.....	500G/FL	2.95	12	8800	7 $\frac{1}{16}$	4 $\frac{1}{4}$	
1000	110, 115, 120	G-40# # # #	Mog. # # Mog. Pref.	Spot—4 $\frac{1}{4}$ " L.C.L..... Flood—5 $\frac{1}{4}$ " L.C.L..... Spot—5 $\frac{1}{4}$ " L.C.L..... Spot—3 $\frac{13}{16}$ " L.C.L.....	1M/G40SP4 $\frac{1}{4}$ 1M/G40FL 1M/G40SP5 $\frac{1}{4}$ 1M/G40PSP	7.00 7.00 7.00 7.50	12	22,500 19,500 22,500	7 $\frac{1}{16}$ 8 8 8 $\frac{7}{16}$	4 $\frac{1}{4}$ 5 $\frac{1}{4}$ 5 $\frac{1}{4}$ 3 $\frac{15}{16}$	
# Heat-resisting glass bulb.											
GENERAL ELECTRIC LAMPS FOR HIGH VOLTAGE SERVICE											
25	220	A-19	Med.	I. F.....	25A	\$ .22	120	215	3 $\frac{15}{16}$	2 $\frac{1}{2}$	Any
50	220 285	A-21	Med.	I. F..... I. F. Mine.....	50A21 50A21	.22 .45	120	470 465	4 $\frac{7}{16}$	2 $\frac{1}{8}$	Any
100	220	A-23	Med.	I. F.....	100A	.33	60	1100	6 $\frac{1}{16}$	4 $\frac{3}{8}$	Any
200	220	PS-30	Med.	Clear..... I. F.....	200 200/IF	.70 .77	24	2740	8 $\frac{1}{16}$	6	Any
300	220	PS-35	Mog.	Clear..... I. F.....	300 300/IF	1.20 1.25	24	4740	9 $\frac{3}{8}$	7	Any
500	220	PS-40	Mog.	Clear..... I. F.....	500 500/IF	1.95 2.10	12	8400	9 $\frac{3}{4}$	7	Any
750	220	PS-52	Mog.	Clear.....	750	5.50	6	13,750	13 $\frac{1}{16}$	9 $\frac{1}{2}$	Any
1000	220	PS-52	Mog.	Clear.....	1000	5.75	6	18,800	13 $\frac{1}{16}$	9 $\frac{1}{2}$	Any
GENERAL ELECTRIC LAMPS FOR LOW VOLTAGE GENERAL LIGHTING SERVICE											
15	6 and 12	A-17	Med.	I. F.....	15A	.40	120	190	3 $\frac{5}{8}$	2 $\frac{3}{8}$	Any
25	6 and 12	A-19	Med.	I. F.....	25A	.40	120	350	3 $\frac{15}{16}$	2 $\frac{1}{2}$	Any
50	6 and 12	A-21	Med.	I. F.....	50A21	.50	120	800	4 $\frac{13}{16}$	3 $\frac{3}{8}$	Any
GENERAL ELECTRIC LAMPS FOR STREET RAILWAY SERVICE											
36	110, 115, 120	A-21 A-19	Med.	I. F..... Clear Head.....	36A/RV 36A/RVH	.25 .77	120	365 375	4 $\frac{7}{16}$ 3 $\frac{15}{16}$	2 $\frac{1}{8}$ 2 $\frac{3}{16}$	Any
56	110, 115, 120	A-21 P-25	Med.	I. F..... Clear Head.....	56A21 56P25	.30 1.10	120 60	620 555	4 $\frac{7}{16}$ 4 $\frac{3}{4}$	2 $\frac{1}{8}$ 2 $\frac{1}{16}$	Any
94	110, 115, 120	P-25	Med.	Clear Head.....	94P25	1.40	60	885	4 $\frac{3}{4}$	2 $\frac{1}{16}$	Any
101	110, 115, 120	A-23	Med.	I. F.....	101A23	.56	120	1150	6 $\frac{1}{16}$	4 $\frac{3}{8}$	Any
201	110, 115, 120	PS-30	Med.	Clear.....	201PS30	1.05	60	3100	8 $\frac{1}{16}$	6	Any
Amps. 1.0	30	A-19	Med.	I. F.....	1A/A19	.42	120	395	3 $\frac{15}{16}$	2 $\frac{1}{2}$	Any
1.6	30	A-21	Med.	I. F.....	1.6A/A21	.50	120	705	4 $\frac{7}{16}$	2 $\frac{1}{8}$	Any



Watts	Volts	Bulb	Base	Finish, Description, etc.	Lamp Ordering Abbreviation (Except Volts)	List Price	Std. Pkg. Qty.	Rated Initial Lumens	Max. Over-all Length (Ins.)	Aver. Light Centre Length (Ins.)	Position of Burning
GENERAL ELECTRIC LAMPS FOR TRAIN, LOCOMOTIVE AND COUNTRY HOME SERVICE											
15	30 and 60 34	A-17 S-14	Med.	I. F. .... I. F. ....	15A 15S14/IF	.27 .26	120	.....	3 5/8 3 1/2	2 3/8 2 1/2	Any
25	30 and 60	A-19	Med.	I. F. ....	25A	.28	120	.....	3 15/16	2 1/2	Any
50	30 and 60	A-21	Med.	I. F. ....	50A21	.28	120	.....	4 15/16	3 3/8	Any
100	30 and 60 32	A-23 A-21	Med. Med.	I. F. .... Clear Loco Head	100A 100A21/3	.46 1.25	60	.....	6 1/4 4 7/8	4 3/8 3	Any BD to H
250	32	P-25	Med.	Clear Loco Head	250P25	1.95	60	.....	4 3/4	3	BD to H

GENERAL ELECTRIC LAMPS FOR AVIATION SERVICE											
100	12	A-19	Med. Pref.	Clear Headlight	100A19	2.40	12	2200	4 1/8	1 3/4	BD to H
240	12	A-19†	Med. Pref.	Clear Headlight	240A19	5.95	12	5750	4 1/8	1 3/4	BD to H
420	12	G-25†	Mog. Pref.	Clear Headlight	420G25P	7.00	12	10,500	5 3/8	1 11/16	BD to H
500	110, 115, 120	T-20	Mog. Pref.	Clear Airway Beacon	500T20/24	4.55	6	9000	9 1/2	3 1/8	BD
1000	30 110, 115, 120	T-20†	Mog. Bip.	Clear Airway Beacon	1M/T20BP 1M/T20BP	9.10 8.50	6 6	25,500	9 1/2	4	BD
1500	32	T-24†	Mog. Bip.	Clear Airport Floodlight	1500T24	19.50	6	42,000	10 1/2	4	BD
3000	32	T-32†	Mog. Bip.	Clear Airport Floodlight	3M/T32	31.00	4	88,500	14	5 3/4	BD
5000	110, 115, 120	T-64†	Mog. Bip.	Clear Airport Floodlight	5M/T64/1	32.00	1	164,000	13 3/8	6 1/2	BD
10000	110, 115, 120	G-96†	Mog. Bip.	Clear Airport Floodlight	10M/G96/2	91.00	1	325,000	17 3/8	10	BD

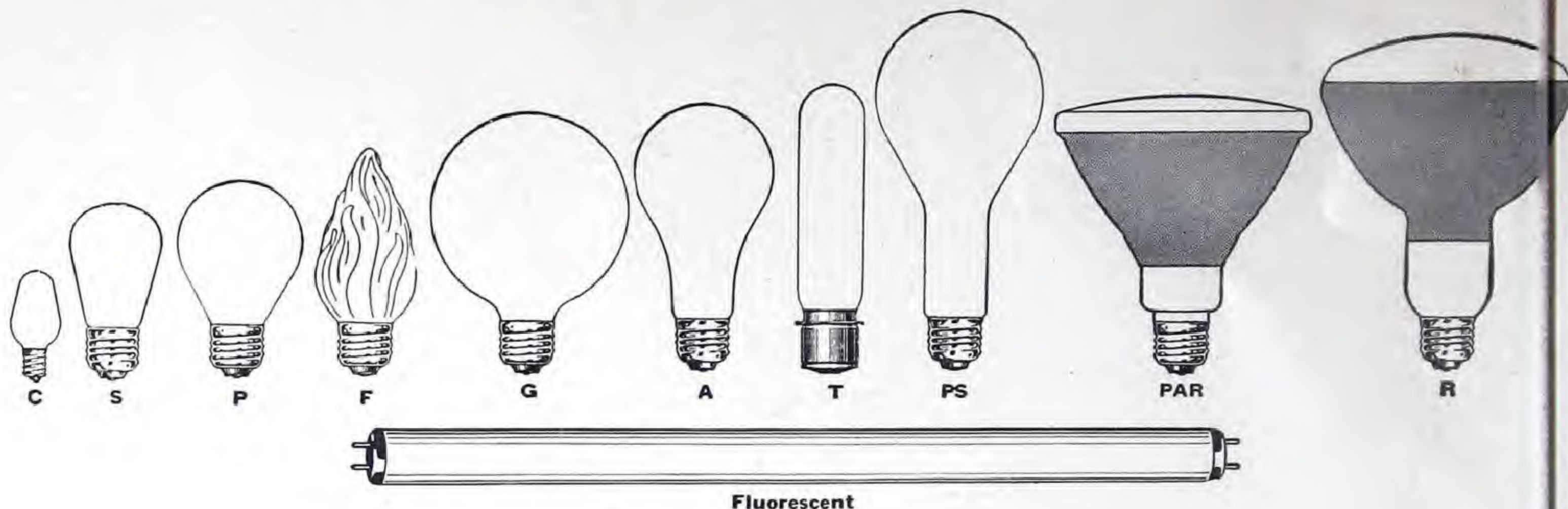
†Heat-resisting glass bulb.

Rated Initial Lumens	Amperes	Bulb	Base	Description	Lamp Ordering Abbreviation	List Price	Std. Pkg. Qty.	Aver. Volts	Max. Over-all Length (Ins.)	Aver. Light Centre Length (Ins.)	Position of Burning
GENERAL ELECTRIC LAMPS FOR STREET SERIES SERVICE—CLEAR BULB											
600	6.6	PS-25	Mog.	.....	600/66	\$ .63	60	6.7	7 1/8	5 3/8	Any
800	6.6	PS-25	Mog.	.....	800/66	.63	60	8.2	7 1/8	5 3/8	Any
1000	6.6	PS-25	Mog.	.....	1M/66	.56	60	9.8	7 1/8	5 3/8	Any
1500	6.6	PS-25	Mog.	.....	1500/66	.84	60	13.9	7 1/8	5 3/8	Any
2500	6.6	PS-25 PS-35	Mog.	.....	2500/66PS25 2500/66	1.10 1.10	60 24	22.0	7 1/8 9 3/8	5 3/8 7	Any Any
4000	6.6 15	PS-35	Mog.	Short—Base Up..... " — " Down.....	4M/66 4M/15BU 4M/15BD	1.30 1.45 1.45	24	33.5 14.9	9 3/8	7	Any B.U. B.D.
		PS-40		Long— " Up..... " — " Down.....	4M/15PS40BU 4M/15PS40BD	2.45 2.45	12		12 3/8	6 1/4 9 1/2	B.U. B.U.
	20	PS-35		Short— " Up..... " — " Down.....	4M/20BU 4M/20BD	2.15 2.15	24	10.6	9 3/8	8 1/4 7	B.D. B.U.
		PS-40		Long— " Up..... " — " Down.....	4M/20PS40BU 4M/20PS40BD	2.45 2.45	12		12 3/8	6 1/4 9 1/2 8 1/4	B.D. B.U. B.D.
6000	6.6 20	PS-40	Mog.	Short—Base Up..... " — " Down..... Long— " Up..... " — " Down.....	6M/66 6M/20BU 6M/20BD 6M/20BU/1 6M/20BD/1	1.90 2.00 2.00 3.15 3.15	12	50.2 15.8	9 3/4	7 6 1/4 9 1/2 8 1/4	Any B.U. B.D. B.U. B.D.
10000	20	PS-40	Mog.	Short—Base Up..... " — " Down..... Long— " Up..... " — " Down.....	10M/20BU 10M/20BD 10M/20BU/1 10M/20BD/1	2.60 2.60 4.10 4.10	12	26.3	9 3/4	7 6 1/4 9 1/2 8 1/4	B.U. B.D. B.U. B.D.
15000	20	PS-40	Mog.	Short—Base Up..... " — " Down..... Long— " Up..... " — " Down.....	15M/20BU 15M/20BD 15M/20BU/1 15M/20BD/1	3.55 3.55 5.00 5.00	12	38.5	9 3/4	7 6 1/4 9 1/2 8 1/4	B.U. B.D. B.U. B.D.
25000	20	PS-52	Mog.	Long—Base Up..... " — " —Down.....	25M/20BU 25M/20BD	6.70 7.40	6	62.2	13 1/8	9 1/2 8 1/4	B.U. B.D.



## Bulb Designations

Some of the most common bulb shapes are shown below. The letter in the bulb designation indicates the shape, and the figure its approximate diameter in eighths of an inch. Thus, a G-25 bulb is a globular or round bulb, 25/8 or 3 1/8 inches in diameter:

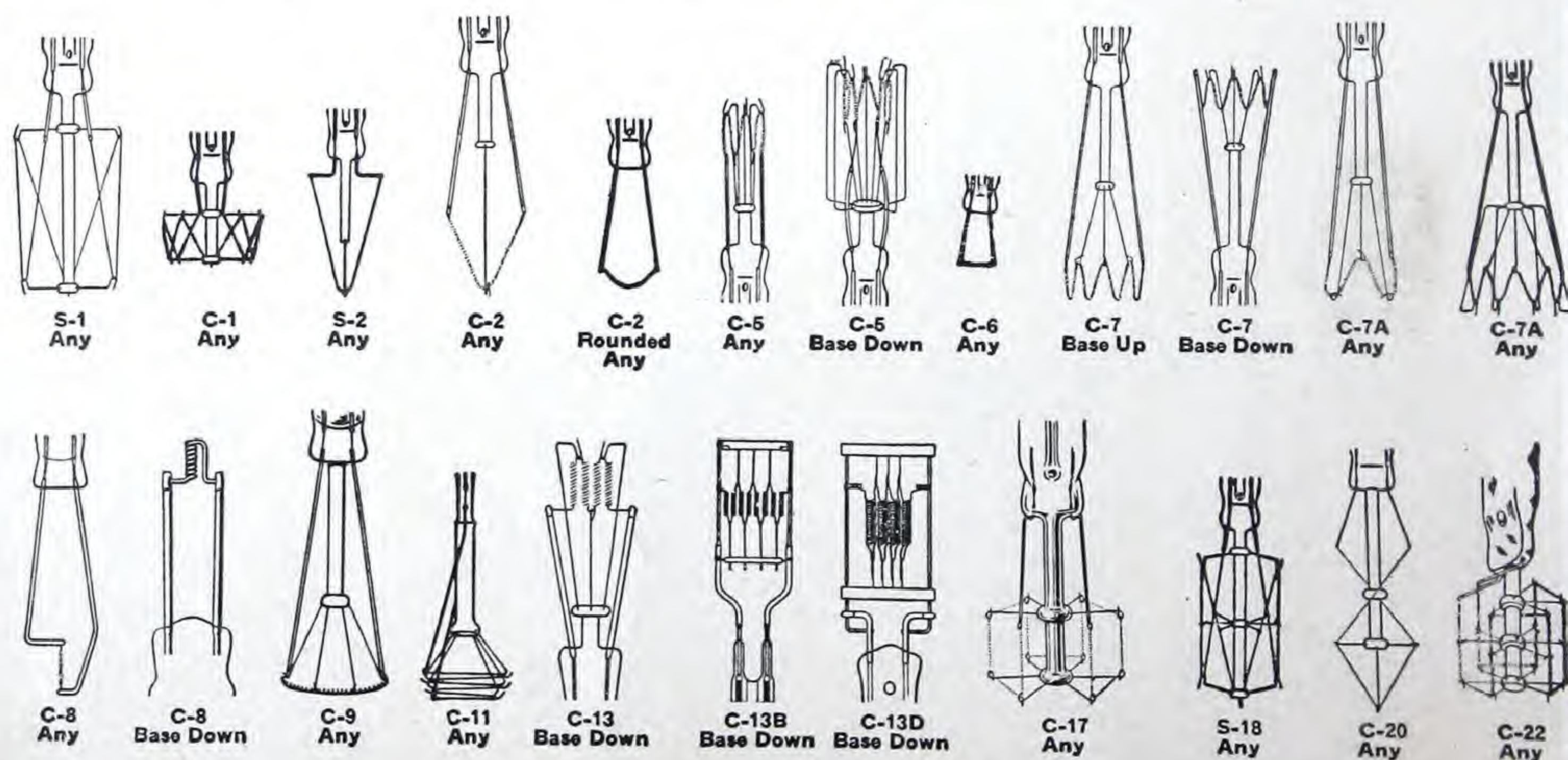


## Base Designations



## Filament Forms

Some of the commonly used filament forms and usual burning positions of each are shown below. The filament form and method of support determines the burning position. The letter "S" preceding the number denotes a "Straight" filament, the letter "C" a "Coiled" filament. Thus, a CC-13 filament is a filament of No. 13 form, made with coiled-coiled wire. A C-13 filament is commonly called a "monoplane" and a C-13D a "biplane." A C-5 is known as a "cluster" type:





 *Nor-Lectric*

August 1944

L-1-2

# BULLETIN



PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

**EDISON**

**L  
A  
M  
P  
S**

**MAZDA**

*Northern Electric*  
COMPANY LIMITED

A NATIONAL ELECTRICAL SERVICE

HALIFAX  
SAINT JOHN, N.B.  
QUEBEC  
TROIS RIVIERES  
SHERBROOKE

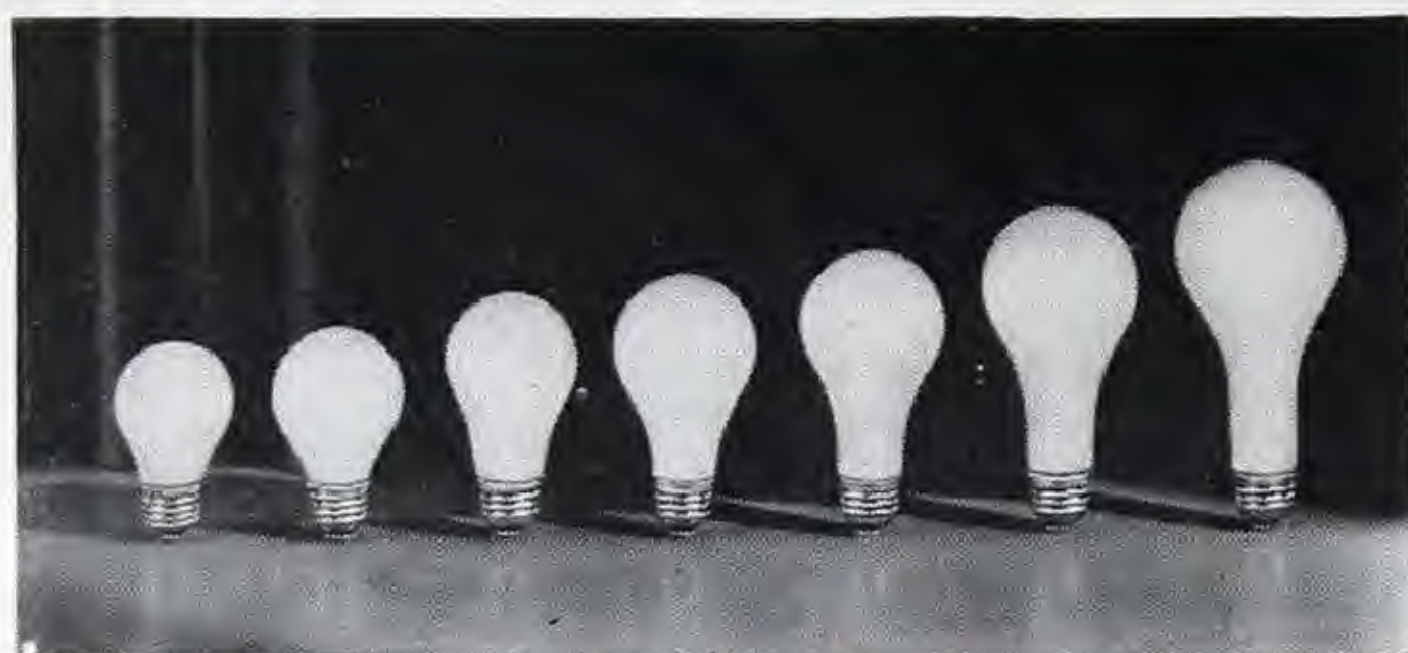
MONTREAL  
OTTAWA  
VAL D'OR  
TORONTO

HAMILTON  
LONDON  
WINDSOR  
KIRKLAND LAKE  
TIMMINS

SUDBURY  
PORT ARTHUR  
WINNIPEG  
REGINA

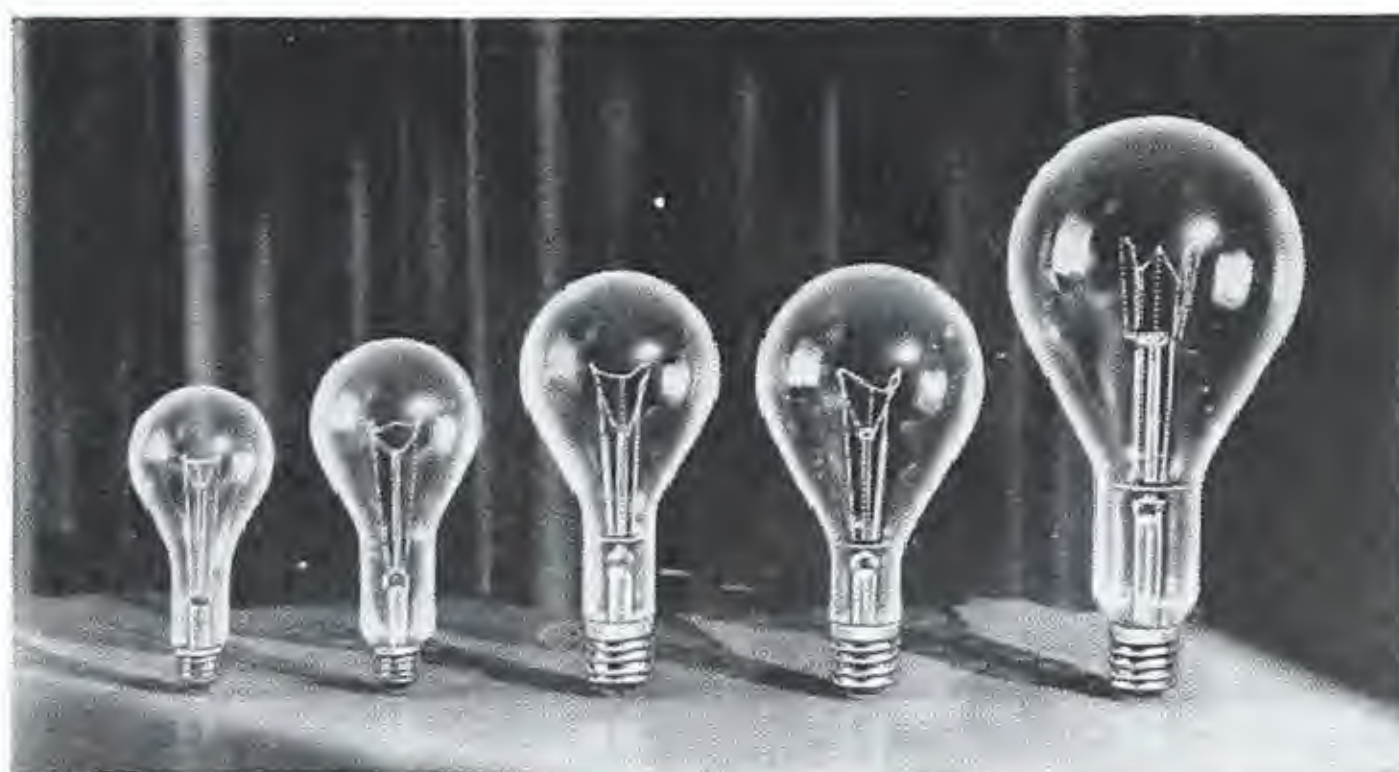
CALGARY  
EDMONTON  
VERNON  
VANCOUVER  
VICTORIA





#### INSIDE FROSTED—GENERAL SERVICE

Inside frosted lamps are suitable for about 90% of all home uses and for many commercial applications. Because they diffuse the light without loss of efficiency, these lamps are preferable for general lighting. They should always be shielded from direct observation by the eye with suitable shades or glassware. Inside frosted lamps are available in the following sizes, 15, 25, 40, 60, 100, 150, 200, 300, 500, 750, 1000 and 1500 watts. The 75 and 250 watt sizes have been temporarily discontinued.



#### CLEAR LAMPS—GENERAL SERVICE

Clear lamps are employed in fixtures where a point light source is required, such as in prismatic glassware or in silvered mirrored glass reflectors used for store window lighting, or in certain types of floodlights. They are used where accurate light control is essential.

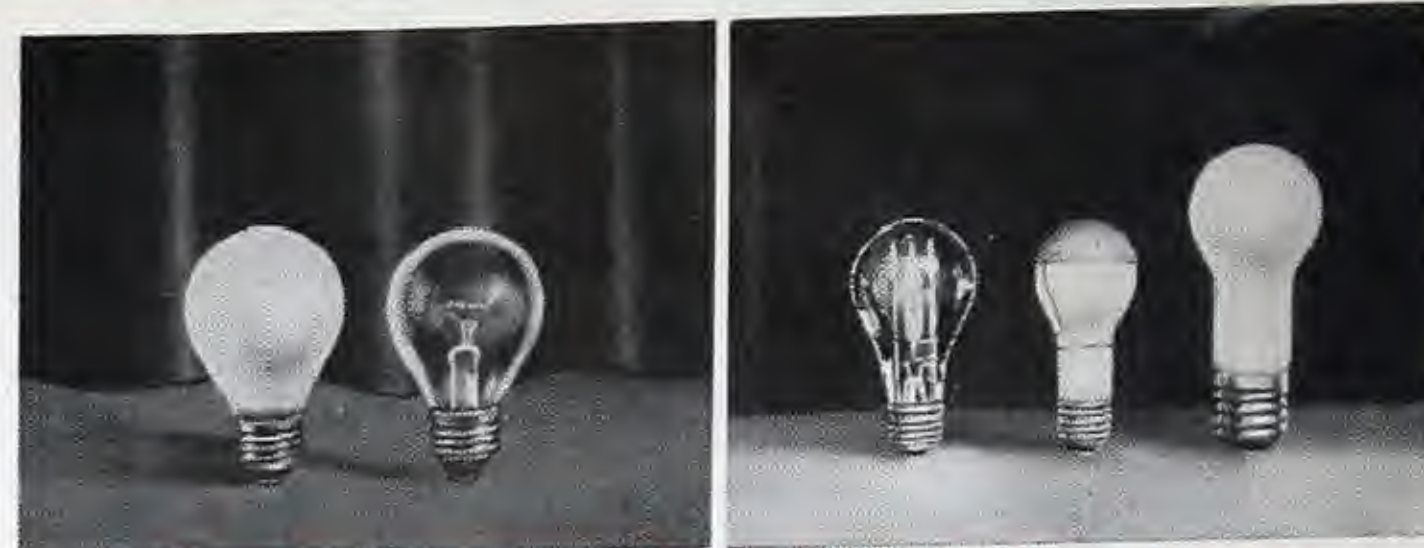
Many people are under the mistaken impression that clear lamps give more light than inside frosted. This is erroneous. Clear lamps are available in (left to right) 100, 150, 200 watt medium base and in 300, 500, 750, 1000 watt mogul base. The 250 watt medium base lamp is temporarily discontinued.

White bowl lamps, formerly used in many industrial fixtures, are temporarily discontinued under authority of the W.P.T.B. Administrator's order. Bowl reflector lamps are effective substitutes for these lamps.



#### MISCELLANEOUS LAMPS

Most of the lamps illustrated above are obtainable. They include from left to right the 6 watt candelabra base lamp for pilot lights, the 7 watt C7 lamp for night lights, the 10 watt intermediate base for general indicator and sign use. They can be supplied in clear I.F. and in inside white, blue, green and red colours. The 10 watt S14 medium base sign lamp is available in clear, I.F., daylight clear and in inside blue, green and red color. The 25 watt A19 coloured lamp is only available in inside, blue, green and red colours. The 40 watt A21 coloured lamps and the 25 watt A19 clear sign lamp are temporarily discontinued.



#### ROUGH SERVICE AND MILL TYPE LAMPS

Rough service lamps (at left) are used where the lamp will be subject to bumps and other shocks, as in extension cord service. They are available in 50 and 100 watt sizes.

Shown next is the clear mill type lamp designed for use with high speed machinery and other locations where vibrations would cause general service lamps to fail. These lamps are not recommended for general lighting since the number of filament supports required to give them special vibration resistant qualities lowers their efficiency. Clear mill type lamps are available in 50 watt size only. The 25 watt size is temporarily discontinued.

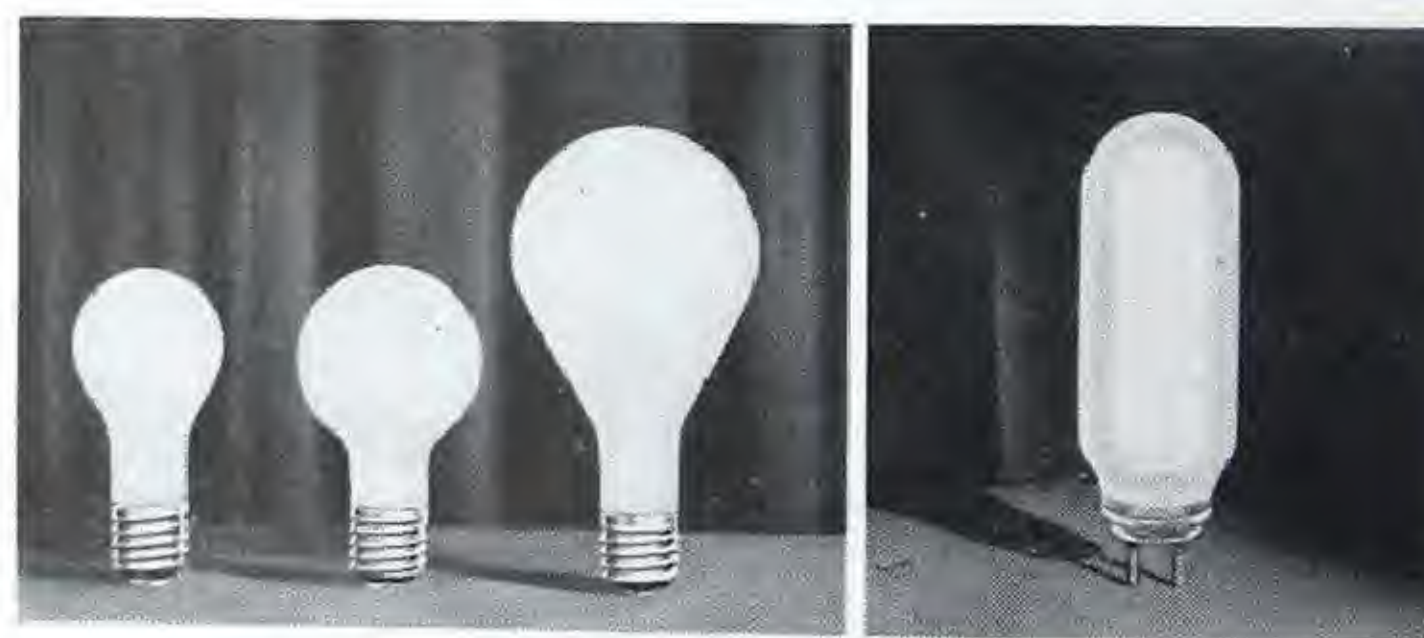
#### SUNLAMPS

The S type sunlamps emit ultra-violet rays similar to those of the sun and produce tanning. While these lamps have proved very beneficial in toning up the body as would tanning in the sun, they are not a cure-all or a substitution for cod liver oil and vitamins when ordered by a doctor.



#### DAYLIGHT LAMPS

Daylight lamps are ideal where a degree of color correction is required. Daylight lamps do not give a true daylight color, they only remove a percentage of the red light associated with incandescent lamps. The only way true (north sky) daylight can be obtained is with daylight Fluorescent lamps. Daylight lamps are available (left to right) in 60 and 100 watt sizes in inside frosted, daylight and in 150, 200, 300 and 500 watt sizes in clear daylight.



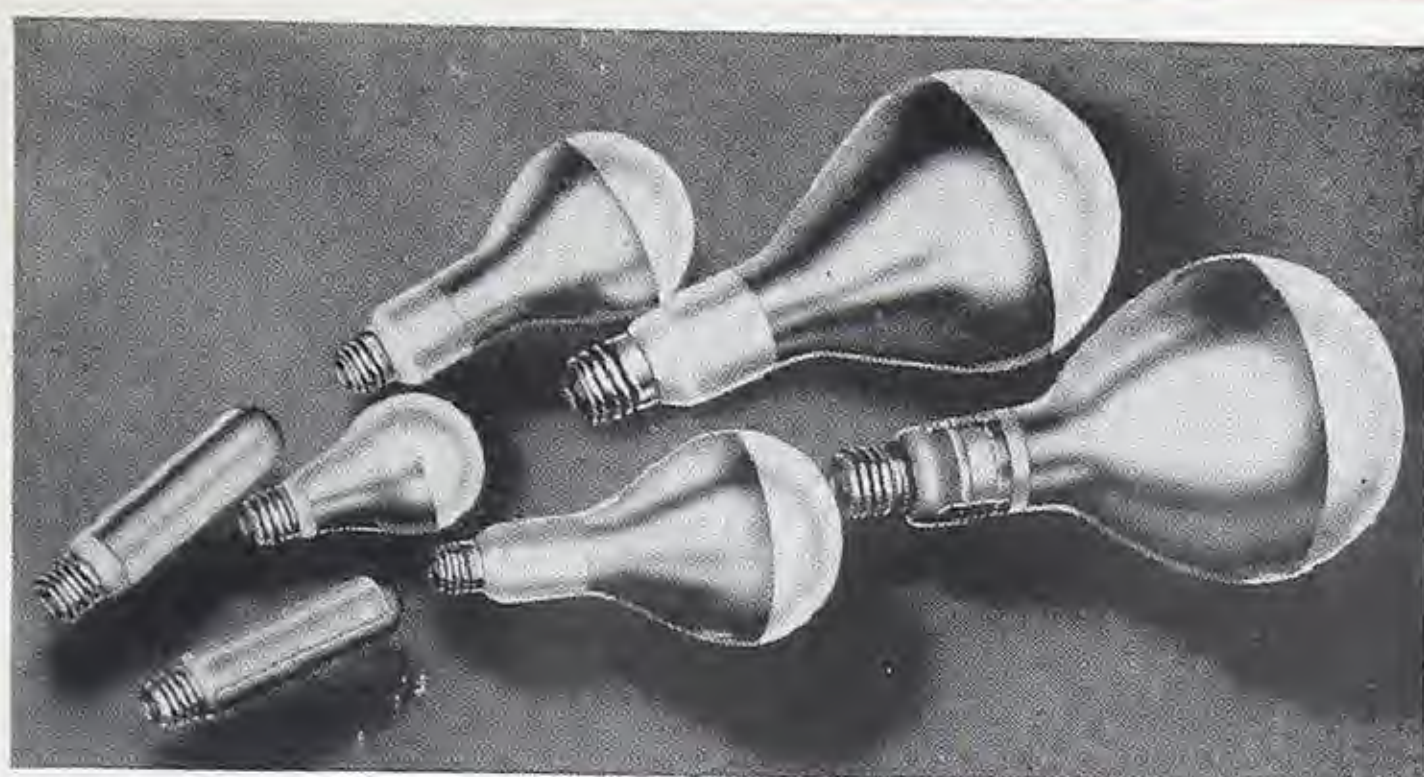
#### 3-LIGHT LAMPS—BIPOST LAMPS

3-light lamps are employed in floor lamps for home use and the 200/300/500 in fixtures for special commercial applications. The following two sizes are available (left to right) 50/100/150 and 100/200/300 watt. The 200/300/500 watt size (at right) is temporarily discontinued.

Medium Bipost lamps are used in certain small sized, high wattage, indirect commercial fixtures and are available in 500, 750 and 1000 watt sizes.

This bulletin is based on information furnished by the Canadian General Electric Company Limited, manufacturers of Edison Mazda lamps.





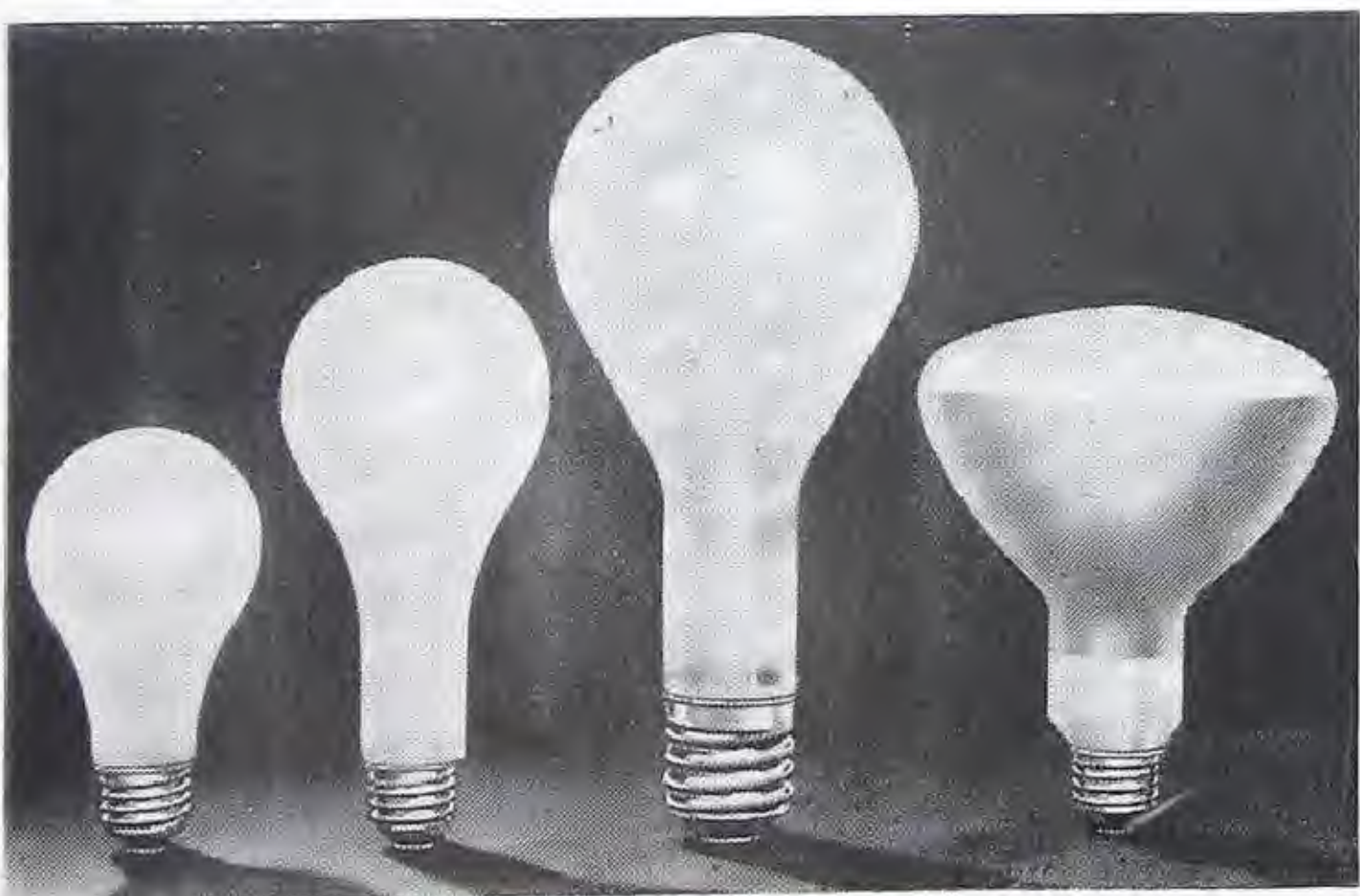
### NECK REFLECTING LAMPS

Neck reflecting lamps are applied where it is impractical to install standard reflectors or where the installation is of such a temporary nature that it would be uneconomical to purchase reflecting equipment. The use of neck reflecting lamps in locations where it is practical to use reflectors is not recommended since the higher cost of the lamp, over standard service types, makes their use rather expensive. These lamps are available in 60, 100, 150, 200, 300, 500, 750 and 1000 watt sizes. The 40 watt size has been temporarily discontinued.



### BOWL REFLECTOR LAMPS

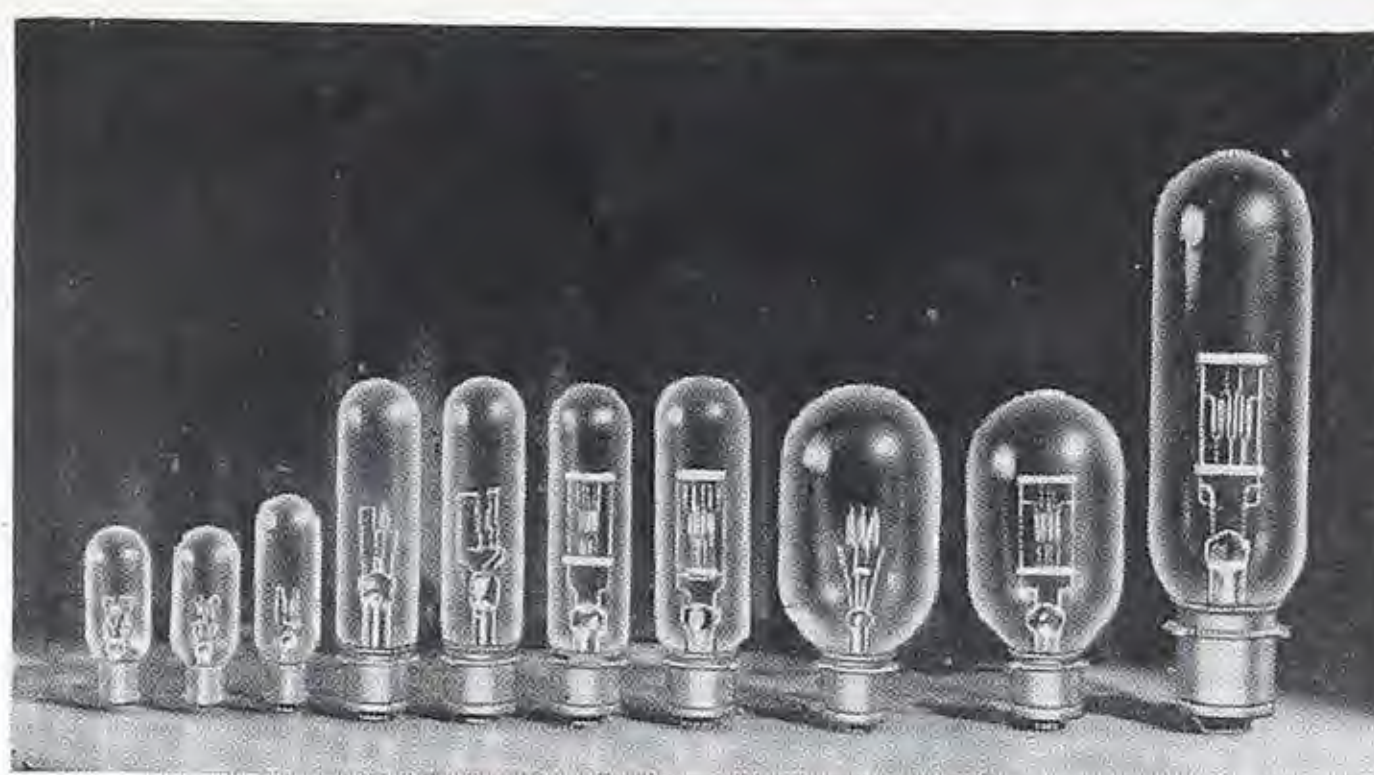
Bowl reflector lamps were originally designed for use with shallow indirect fixtures and in certain industrial units. Today, in addition to these functions, bowl reflector lamps find many applications where an indirect source of light is required. They are available in 60, 100, 150, 200, 300, 500, 750 and 1000 watt sizes with inside frosted necks. The 25, 40 and 75 watt sizes have been temporarily discontinued as have all wattages with clear glass necks.



### PHOTOFLOOD LAMPS

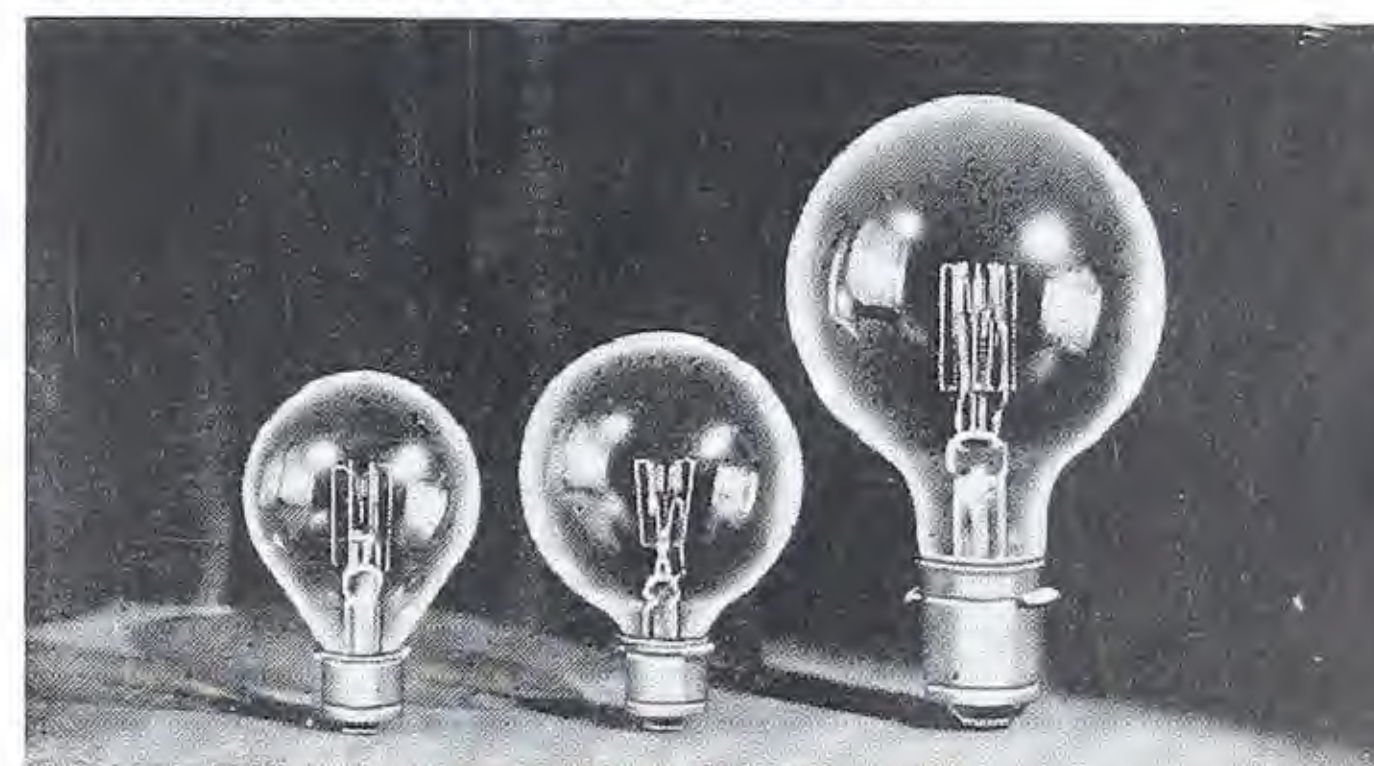
Photoflood lamps are used for taking indoor photographs. Although they have a very short life, varying from two to ten hours, these lamps are very popular with the amateur photographer. They come in four sizes and are known as, from left to right, No. 1, No. 2, No. 4 and No. R2 reflector photoflood, rated at 250, 500, 1000 and 500 watts respectively.

Photoenlarger lamps, similar in size to the photofloods but finished with a heavy inside white coating are used in processing and printing amateur and professional photographs.



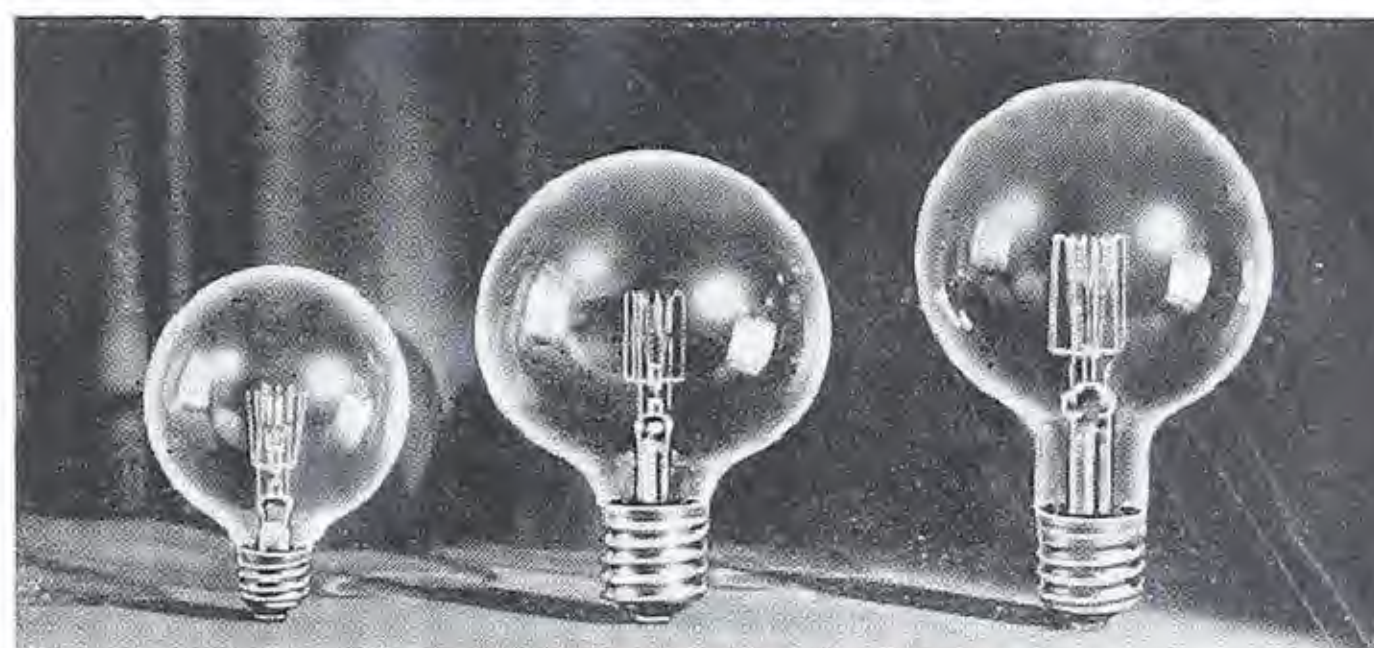
### PROJECTION LAMPS

Projection lamps are employed in motion picture machines, stereopticons and film slide projectors as well as in many instruments. When ordering these lamps, a number of points should be specified. For instance, bulb size, bulb shape (usually tubular), type of base, filament shape, voltage and watts or ampere. A guide to these ordering points will be found at the beginning of the Nor-Lectric Bulletin L-1-1.



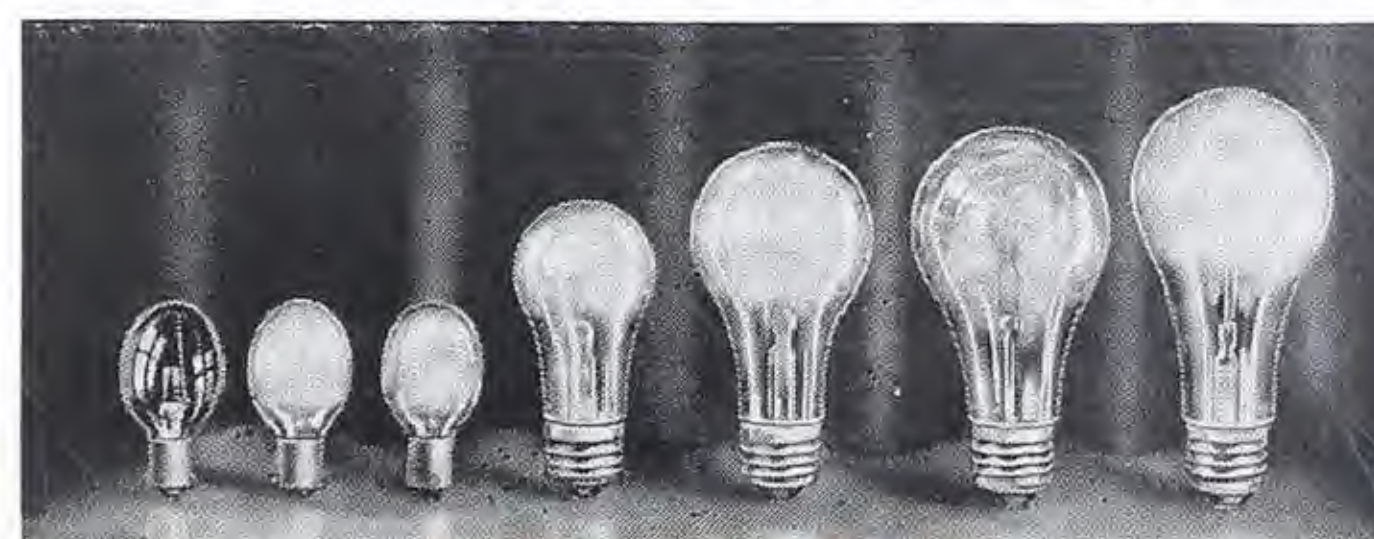
### SPOTLIGHT LAMPS

Spotlight lamps are used in equipment designed for their characteristics and when ordering these lamps information similar to that required for projection lamps is usually necessary.



### FLOODLIGHT LAMPS

Floodlight lamps are used in equipment designed for their characteristics and when ordering these lamps information similar to that required for projection lamps is usually necessary.



### PHOTOFLASH LAMPS

Photoflash lamps are excellent for indoor and outdoor photography where it would be inconvenient to set up regular photographic lighting equipment. They come in a number of sizes as illustrated above. At the present time most of the production facilities for these lamps are engaged in filling the needs of military and newspaper photographers. They will again be available in quantity after the war.





#### PROJECTOR AND REFLECTOR SPOTLIGHTS

Projector and reflector spotlights find application where it would not be economical to use standard spotlight and floodlight equipment. The R40 type of lamp is the least expensive of the two but has the disadvantage of relatively poor light control and it is also subject to cracking when used out-of-doors. The PAR38 lamps are made of hard cast glass. The lens section is optically designed to give accurate light control and the whole lamp will stand exposure to a wide range of temperature and moisture conditions. These lamps are recommended for all outdoor uses and where accurate light control is an important factor. The R40 lamps (left) are available in 150, 200 and 300 watt sizes and in both spotlight and floodlight distributions. The 150 watt projector spot is shown in center and the 150 projector flood at right.



#### DRYING AND HEAT LAMPS

Drying lamps are primarily designed for drying paints and varnishes of the synthetic type. However, their use has been extended to a wide variety of heat applications such as expanding piston rings, drying glue, etc. The 250 watt reflector type illustrated is the most popular for making paint repairs to automobiles or furniture in local garages and shops. Drying lamps are also employed to provide heat for brooders and for other heat applications around the farm. Clear drying lamps of 250, 400, 500 and 1000 watt sizes are made for use in suitable reflectors and are the type most generally used in industry. The 250 watt reflector heat lamp is designed for infra-red therapy.



#### DECORATIVE LAMPS

All decorative lamps have been classified by the W.P.T.B. as non-essential. These lamps are temporarily discontinued: 15W F10, 15 and 25 watt F15, 25 watt G18½ and the 25 and 40 watt G25 decorative lamps.

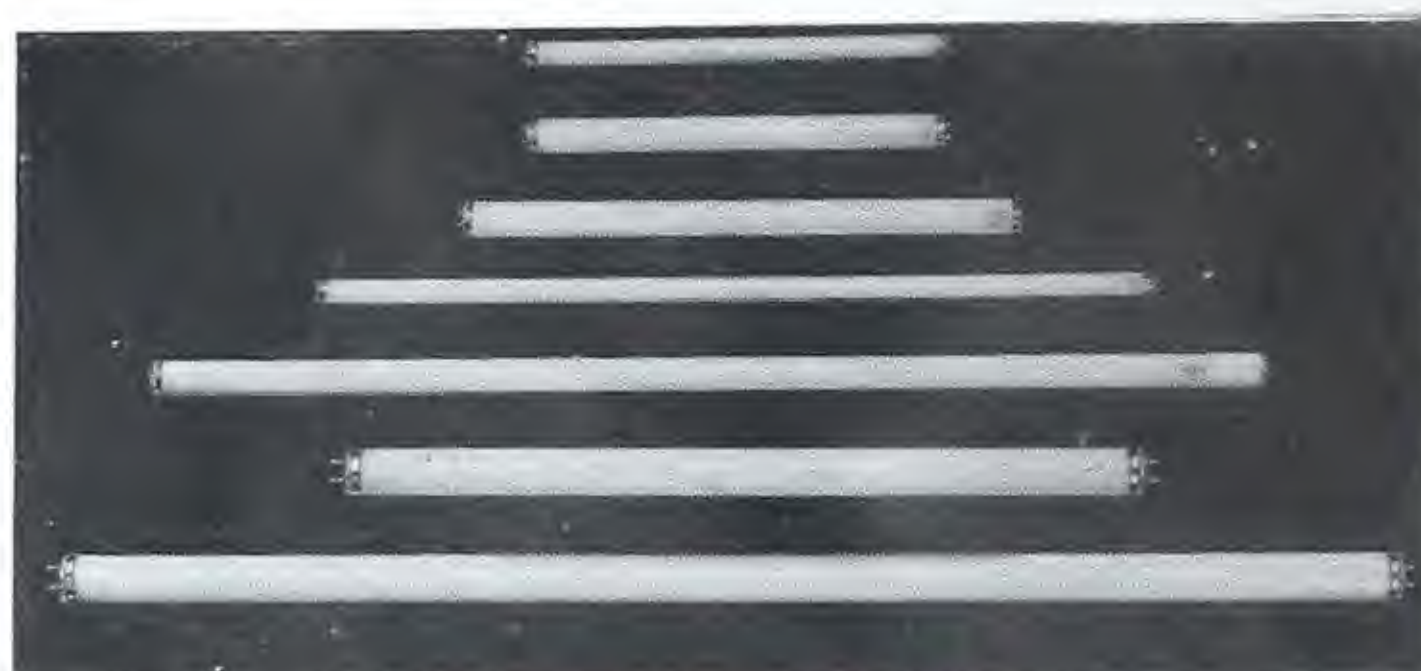


#### SHOWCASE AND LUMILINE LAMPS

These lamps are tubular in shape and are designed for use in restricted locations such as in showcases. Because of their long thin filament, they will not resist shocks. Left to right, T6½ intermediate base lamp; 24-watt T10 medium base lamp. The 40 watt T8 medium base lamp. The 25 and 50 watt T8 lamps are temporarily discontinued.

#### LUMILINE LAMPS

Coloured lumiline lamps have been temporarily discontinued. While lumiline lamps, in clear and white, are shown in our price lists, deliveries are uncertain. Lumiline lamps are made in three sizes—30 and 60 watt 18 inches long and in the 40 watt size 12 inches long.



#### FLUORESCENT LAMPS

These lamps are made in 4 watt, 6, 8, 14, 15, 20, 30, 40, 65 and 100 watt sizes, varying in length from 6 inches to 5 feet. At present Fluorescent lamps are available only in white and daylight colours as the soft white, blue, green, pink, red and gold colours have been temporarily discontinued. The 4, 6, 20, 30 and 40 watt sizes are available also in a 360BL (Black Light) colour for fluorescing minerals, inks, etc.



#### GERMICIDAL LAMPS

A special tubular lamp which resembles the Fluorescent in size and shape, but which uses a clear quartz glass, has the power to kill fungi and many air-carried germs. This lamp, known as the germicidal lamp, is finding rapid public acceptance and at present is being used in public places such as schools, hospitals, public halls and in many manufacturing plants handling food. In the near future it will probably be found in the home. The common sizes of Germicidal lamps are the 8, 15 and 30 watt sizes.

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REGINA

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VICTORIA



# NOR-ELECTRIC BULLETIN



## PHOTO LAMPS



### THE MIGHTY MIDGET

Two dozen of these "mighty midgets" can be conveniently carried in an overcoat pocket.

With their dye protected internal and external lacquer safety jacket these sturdy egg-shaped photoflash lamps set a new high in safety yet develop plenty of light to get pictures in its split-second flash.

The bayonet base not only permits bulb changes in a jiffy but also accurately focuses lamp in its reflector.



## G-E PHOTOFLASH LAMPS FOR BLACK-AND-WHITE PHOTOGRAPHY

### G-E MIDGET PHOTOFLASH BULBS

For dependable uniform timing, consistent light output, convenience of carrying and handling, positive contact and rugged construction, low-cost G. E. Midgets give the amateur and professional photographer the utmost in flash value.

There's a Midget Photoflash lamp for every picture purpose—for black-and-white, color and focal plane use. Users say G. E. Midgets can get 95 per cent of all pictures.

Included in these lamps are the Speed Midget SM, which reaches peak light in 5 milliseconds—four times faster than other photoflash lamps; the G. E. No. 5, excellent for all-around flash pictures, and giving precise, split-second performance, and the No. 6 Photoflash lamps designed for high shutter speed synchronization with all focal plane shutters except those requiring the ultra-long peak of the G. E. No. 31 lamp.

### SCREW BASE LAMPS

Which photoflash lamp to use from this group is easily decided by comparing the important features of each lamp. Screw base photoflash lamps are for average reflectors furnished with synchronizers and for studio reflectors. Lamps No. 11 and 22 are similar and may be used interchangeably with any synchronizer set to hit the 20 millisecond peak. Thus, two bulb sizes and two degrees of light are available for use in such screw base equipments.

Lamp No. 31 is made for focal plane synchronization only. Lamp No. 50 is for use in covering large areas—peaks at 30 milliseconds and may be used in any synchronizer set for 20 millisecond lamp, at slow shutter speeds (1/25 - 1/10 - etc.)

## G-E PHOTOFLASH LAMPS FOR BETWEEN-THE-LENS SHUTTERS

### SYNCHRO-PRESS NO. 5 B-11 Bulb, S.C. Bay. Base

Excellent for all-around pictures in proper reflectors. Precise, uniform, split-second flash, ideal for synchronized use with between-the-lens shutters. Bayonet base permits quick change, holds bulb tight in accurate position. Adapters fit it to present equipment. For battery flashing only.



### SYNCHRO-PRESS NO. 11 A-15 Bulb, Medium Screw Base

The Synchro-Press No. 11 is a general purpose lamp for accurate synchronization, as well as open flash shots, for press and amateur use, with between-the-lens shutters. An excellent combination of compactness and light power.



### SYNCHRO-PRESS NO. 22 A-19 Bulb, Medium Screw Base

A general purpose lamp of greater power than the No. 11 for open shots, and for accurate synchronizers. It has a medium broad peak to allow for errors in synchronization. For use with front-shutter cameras, the lamp provides plenty of peak light for extra coverage and high-speed shots.



## G-E PHOTOFLASH LAMPS FOR SPECIAL PURPOSES

### SPEED MIDGET SM B-11 Bulb, S.C. Bay. Base



### PHOTOFLASH NO. 50 A-21 Bulb, Medium Screw Base

Great light intensity in compact bulb size, to cover large areas and for exposure at small lens aperture. Provides ample light on subject during full time shutter is open. 30 millisecond peak synchronizes at 1/25 second. Operates on 3 to 125 volts direct or alternating current.

A quick flash. For all-around near distance pictures, in proper reflectors. Stops action on "open" flash about as effectively as a 1/200th second shutter setting. Synchronization is simple, accurate and positive, with special synchronizers. For battery flashing only.

### FOCAL PLANE NO. 6 B-11 Bulb, S.C. Bay. Base



For high-shutter speed synchronization with the majority of focal plane shutters. This includes most cameras up to 3 1/4 x 4 1/4. Bayonet base for quick handling, secure contact. Midget size and convenient. Especially effective in concentrating reflectors. For battery flashing only.

### FOCAL PLANE NO. 31 A-21 Bulb, Medium Screw Base

For high-shutter speed synchronization with focal plane shutters for those cameras requiring a lamp of longer flash duration than is provided by the No. 6. This lamp provides ample light on the subject during the full time the shutter is open. For battery flashing only.





## G-E PHOTOFLOOD AND PHOTOFLOOD REFLECTOR LAMPS



**PHOTOFLOOD  
Nos. 1, B1**

Same size as a standard 100-watt lighting lamp, drawing 250 watts at 115 volts (2.2 amperes), yet photographically equal to as much as 750 watts in standard lighting lamps. As many as six No. 1 Photoflood lamps may be safely used on one regular house lighting circuit. Rated life: 3 hours at 115 volts.



**PHOTOFLOOD  
Nos. 2, B2**

Same size as a standard 150-watt lighting lamp, drawing 500 watts at 115 volts (4.4 amperes), yet photographically equal to as much as 1500 watts in standard lighting lamps. Three Photoflood lamps No. 2 may be safely used on one regular house lighting circuit. Rated life: 6 hours at 115 volts.



**PHOTOFLOOD  
Nos. 4, B4**

Same size and shape as the regular 300-watt general service lamp with mogul screw base. Draws 8.7 amperes at 115 volts. Easily  $2\frac{1}{2}$  times as effective photographically as the regular 1000-watt lamp. Rated life: 10 hours at 115 volts.



**Reflector Photospot  
No. RSP2**

The RSP2—identical in size, shape, wattage, life and color temperature with the RFL2—is ideal for highlighting, back-lighting and edgelighting. Its light has been squeezed into a beam of approximately  $20^\circ$ —resulting in a punch of light more than seven times more powerful than that of the RFL2.



**Reflector Photoflood  
No. RFL2**

Gives a smooth 60-degree controlled beam. Has built-in reflector. Draws 500 watts at 115 volts (4.4 amperes), yet photographically equal to 1500 watts in standard lighting lamps in good reflectors. Three may be safely used on one regular house lighting circuit. Rated life: 6 hours at 115 volts.

## G-E PHOTO ENLARGER LAMPS

No. 111—A small, white-bulb, high-efficiency lamp with bayonet base. For use in some miniature enlargers. The smooth white glass provides excellent diffusion, gives even distribution of light. Will not discolor or become scratched. Approximate watts: 75.

No. 211-212-213—High-efficiency, white-bulb lamps. Excellent diffusion and light distribution.

No. 211 is 75 watts, No. 212 is 150 watts and No. 213, 250 watts—(photoflood type—3-hour life approximate).

Three-Lite, 50-100-150 watts—The three-life gives low wattage and light for set-up and focusing—more light for exposure. Requires special switch and socket.

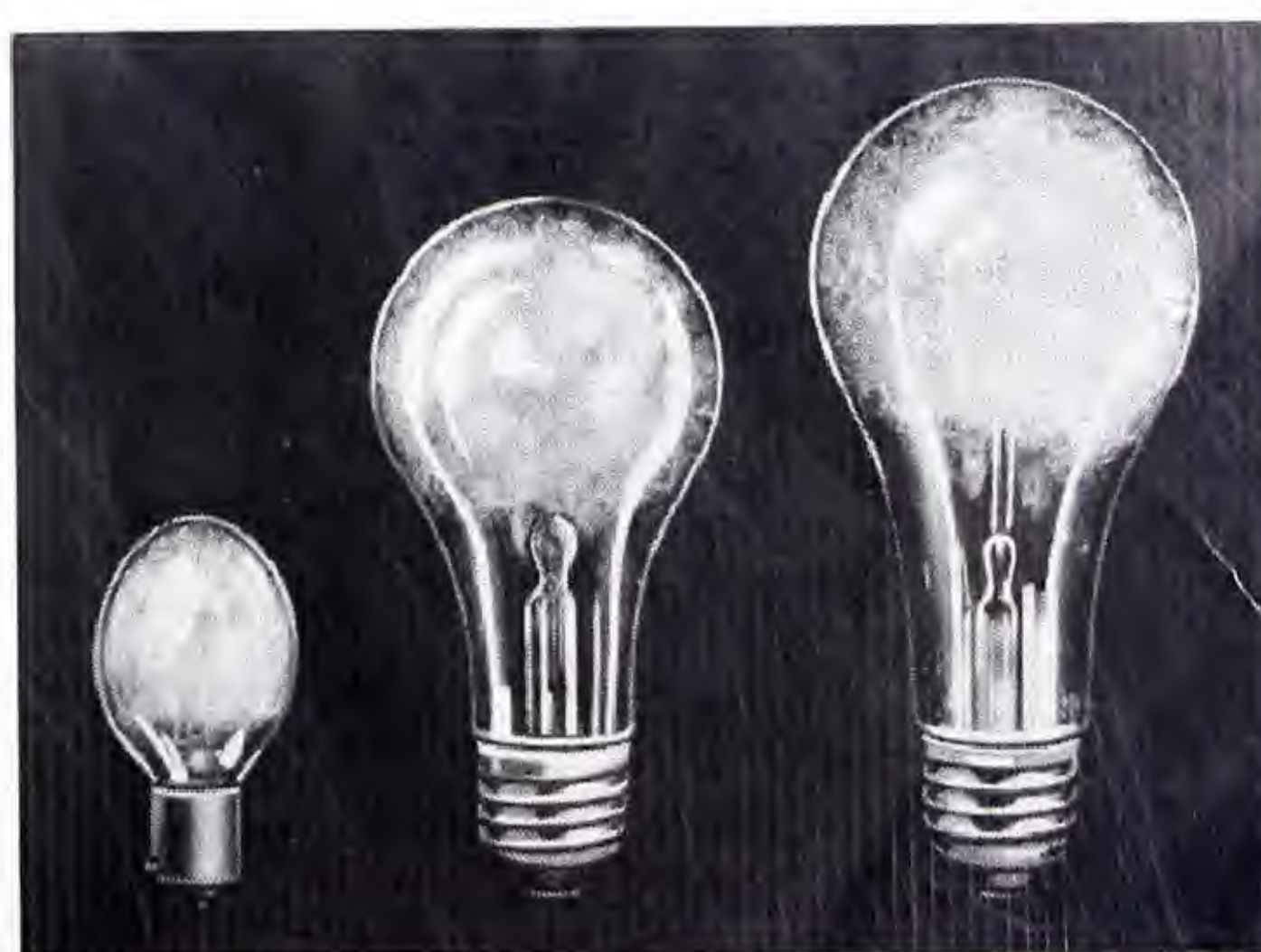


## G-E BLUE FILTER PHOTOFLASH LAMPS

No. 5B—Same construction as Synchro-Press No. 5, with blue filter coating for correct reproduction with daylight type color film. An excellent lamp as the sole source of illumination for daylight film without filter or to supplement daylight in outdoor color shots. Like all midget lamps, the No. 5B should be used in reflectors especially designed for lamps having the small size (B-11) bulb.

No. 22B—No. 22B is a lamp of the same general characteristics as No. 22 with a blue filter coating carefully matched to the color characteristics of daylight color emulsions. Designed to solve the problem of providing supplementary flash illumination for daylight color shots, the lamp has also been found excellent as the sole source of light with Daylight Type films. Has medium screw base.

No. 50B—Possesses great light intensity in compact bulb size—has same general characteristics as No. 50, but with a blue filter coating carefully matched to the color characteristics of daylight color emulsions. Has 30 millisecond peak, synchronizes at  $1/25$  second. Operates on 3 to 125 volts direct or alternating current. Has medium screw base.





**PHOTOFLASH—Clear Inside and Clear or Colored Outside Laquered Bulb.**

Lamp No.	Bulb	Base	Voltage Range for Operation	M. O. L. (in.)	Std. Pkg. Qty.	Rated Lumen Seconds	Rated Peak Lumens	Approx. Time To Peak	Approx. Flash Duration at 1/2 Peak	Approx. Mean Col. Temp. (°Kelvin)	Recommended Type Film	For Synchronization with Indicated Type Shutters
						In Thousands		In Seconds				
SM	B-11	S.C. Bay	3†	2-5/8	120	4 1/2-5	1000	.005	.005	3300	Fast	Between-the-Lens
5	B-11	S.C. Bay	3†	2-5/8	120	17-19	1300	.020	.012	3800	Any	Between-the-Lens
5B	B-11	S.C. Bay	3†	2-5/8	120	7-8	550	.020	.012	6000	Day. Col.	Between-the-Lens
5R†	B-11	S.C. Bay	3†	2-5/8	120	.....	.....	.020	.012	Infrared	Infrared	Between-the-Lens
6	B-11	S.C. Bay	3†	2-5/8	120	16-18	700	....	.030	3800	Fast	Focal Plane
11	A-15	Med.	3†	4	120	30-35	2500	.020	.009	3800	Any	Between-the-Lens
22	A-19	Med.	3-125*	5	120	70-75	4300	.020	.015	3800	Any	Between-the-Lens
22B	A-19	Med.	3-125*	5	120	28-32	1800	.020	.015	6000	Day. Col.	Between-the-Lens
22R†	A-19	Med.	3-125*	5	120	.....	.....	.020	.015	Infrared	Infrared	Between-the-Lens
31	A-21	Med.	3†	5-3/8	60	80-90	1500	....	.053	3800	Fast	Focal Plane
50	A-21	Med.	3-125*	5-3/8	60	110-125	6000	.030	.013	3800	Any	Between-the-Lens°
50B	A-21	Med.	3-125*	5-3/8	60	45-55	2500	.030	.013	6000	Day. Col.	Between-the-Lens

**PHOTOFLOOD—Inside Frosted Bulb**

Lamp Ordering Abbreviation	Bulb	Base	Nominal Voltage	M.O.L. (in.)	Std. Pkg. Qty.	Rated Lumens at 115V	Approx. Watts at 115V	Approx. Mean Col. Temp. (°Kelvin)	Approx. Hours Life at 115V
PH/1	A-21	Med.	115-120	4-15/16	60	8650	250	3400	3
PH/2	PS-25	Med.	115-120	6-15/16	24	17000	500	3400	6
PH/RF1.2	R-40△	Med.	115-120	6 1/2	①	500	500	3400	6
PH/RSP2	R-40△	Med.	115-120	6 1/2	②	500	500	3400	6
PH/4	PS-35	Mog.	115-120	9-3/8		33500	1000	3400	10

**PHOTOFLOOD—Inside Frosted Daylight Bulb**

PH/B1	A-21	Med.	115-120	4-15/16	60	5600	250	4800 □	3
PH/B2	PS-25	Med.	115-120	6-15/16	24	11000	500	4800 □	6
PH/B4	PS-35	Mog.	115-120	9-3/8	24	21800	1000	4800 □	10

**PHOTOGRAPHIC ENLARGER—White (Ceramic Coated) Bulb**

Lamp	Bulb	Base	Nominal Voltage	M.O.L. (in.)	Std. Pkg. Qty.	Rated Lumens	Approx. Watts	L.C.L. (in.)	Hours Life
PH/50/150	A-21	3 Cont. Med.	115-125	4-15/16	60	....	50/100/150	3-3/8	100
PH/111+	S-11	S.C. Bay	115-125	2-3/8	100	1125	75	1-3/8	25
PH/211	A-21	Med.	115-125	4-15/16	60	1300	75	3-3/8	100
PH/212	A-21	Med.	115-125	4-15/16	60	3100	150	3-3/8	100
PH/213	A-21	Med.	115-125	4-15/16	60	8000	250	3-3/8	3
PH/301	PS-30	Med.	115-125	8-3/16	24	6700	300	6	100
PH/302	PS-30	Med.	115-125	8-3/16	24	11600	500	6	100
PH/303	PS-30	Med.	115-125	8-3/16	24	15800	500	6	6

- + Burning position—base down to horizontal. Base pins in plane of fil. Use only in equipment that provides adequate ventilation.  
△ Outside opaque neck coated.  
□ Intended to supplement daylight.  
① Max. beam C.P. 6500—beam spread to 50% of max. beam C.P. is 80°—90°.  
② Max. beam C.P. 50,000—beam spread to 50% of max. beam C.P. is 15°—20°.  
† Flash with dry cells only (two or more).  
\* Flash with dry cells (two or more) or on standard lighting circuits.  
‡ Designed for service other than illumination.  
° Studio and press. 1/50 second or slower.

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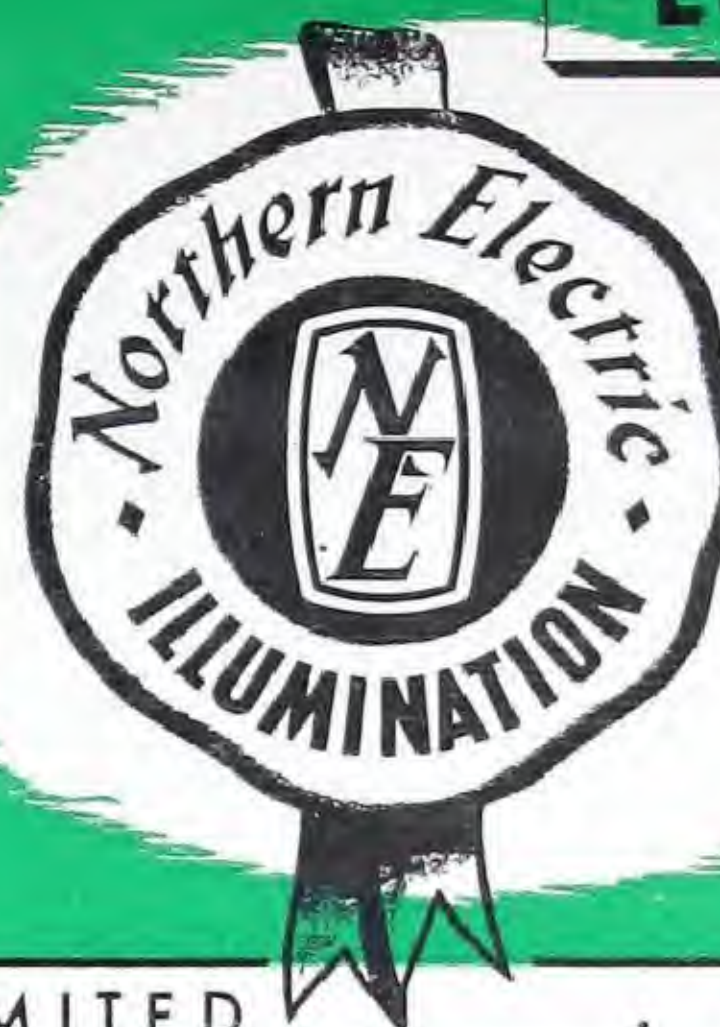
HAUFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
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FORT WILLIAM WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA






**Nor-Electric**
**L-2-1**

# BULLETIN

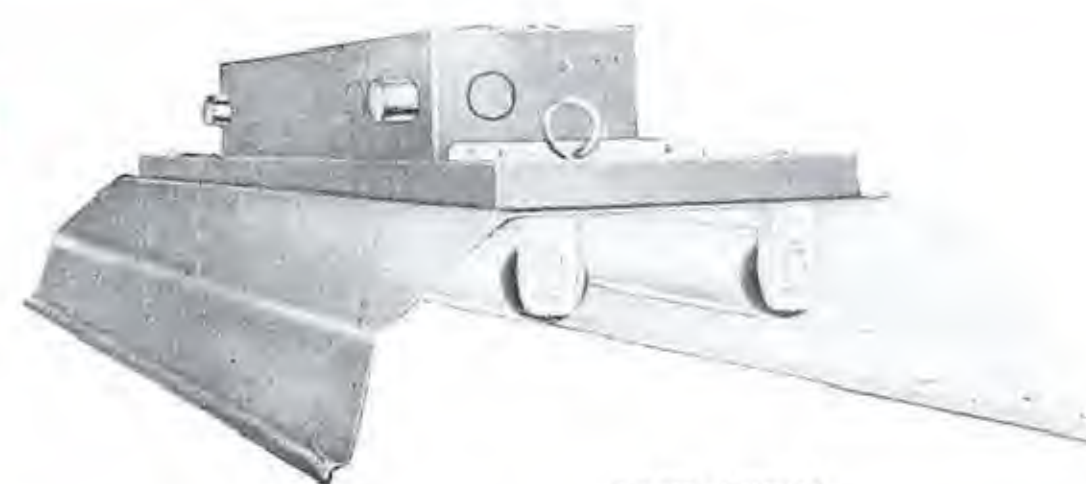


Destroy  
Previous  
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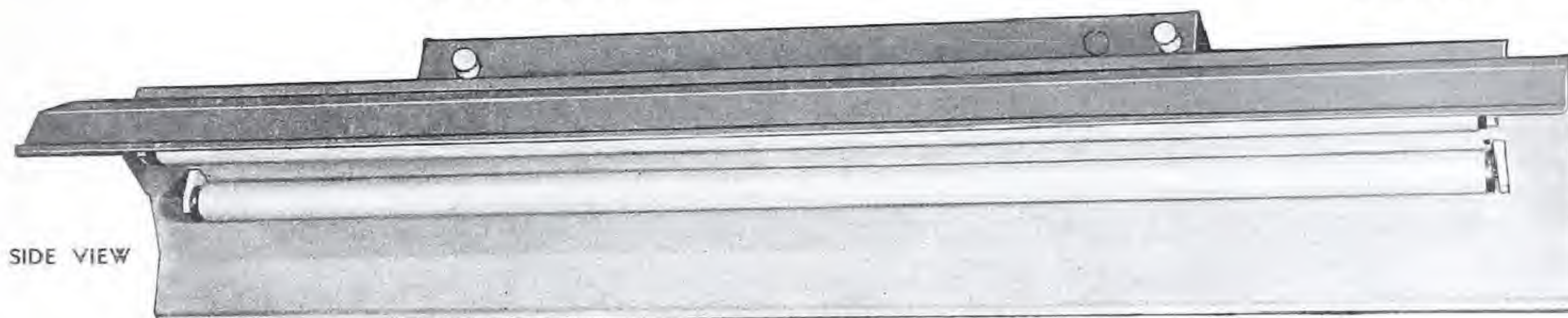
PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED . 1943

## Fluorescent Lighting Units with Enameled Steel Reflectors

For 2-100 watt Lamps  
2- 40 watt Lamps  
3- 40 watt Lamps



END VIEW



SIDE VIEW

### Construction

These units consist of a steel reflector having a baked synthetic enamel finish. Outside enamel finish is gray, and reflecting surfaces are finished in white enamel. Enamel is baked on at approximately 300°F., and has been selected for its durability, cleanability and resistance to marring. The hood, finished in gray enamel, has been designed to conserve steel and also improve appearance.

FOR USE WITH	CYCLES	CATALOGUE NUMBER, WIRED	OVERALL DIMENSIONS, INCHES		
			LENGTH	WIDTH	DEPTH
2—100-watt Lamps	60	<b>160162-60</b>	65 $\frac{1}{4}$	16	9 $\frac{3}{8}$
2—40-watt Lamps	60	<b>148162-60</b>	52 $\frac{1}{2}$	14	7 $\frac{3}{4}$
	25	<b>148162-25</b>	52 $\frac{1}{2}$	14	7 $\frac{3}{4}$
3—40-watt Lamps	60	<b>148163-60</b>	52 $\frac{1}{2}$	14	7 $\frac{3}{4}$

All units are for 110-125 volt operation.

### Mounting

For wire or chain suspension two transverse angle irons are provided. These are spaced 33 $\frac{1}{2}$ " apart on 100 W. units and 29 $\frac{5}{8}$ " apart on 40 W. units. Each is punched with 3 holes,  $\frac{3}{8}$ " diameter, spaced 1 $\frac{1}{2}$ " apart giving 3 $\frac{5}{16}$ " spacing on the outside holes.

For conduit suspension two  $\frac{1}{2}$ " K.O. on 21 $\frac{1}{2}$ " centres are provided on both 100 W. and 40 W. units.

### 25-Cycle Applications

There are a limited number of applications where two-lamp units may give satisfactory results when supplied from 25-cycle systems. Before quoting on or ordering these units, each case of this kind should be studied to make sure that the lighting produced by these units will be satisfactory to the workers.

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LIMITED

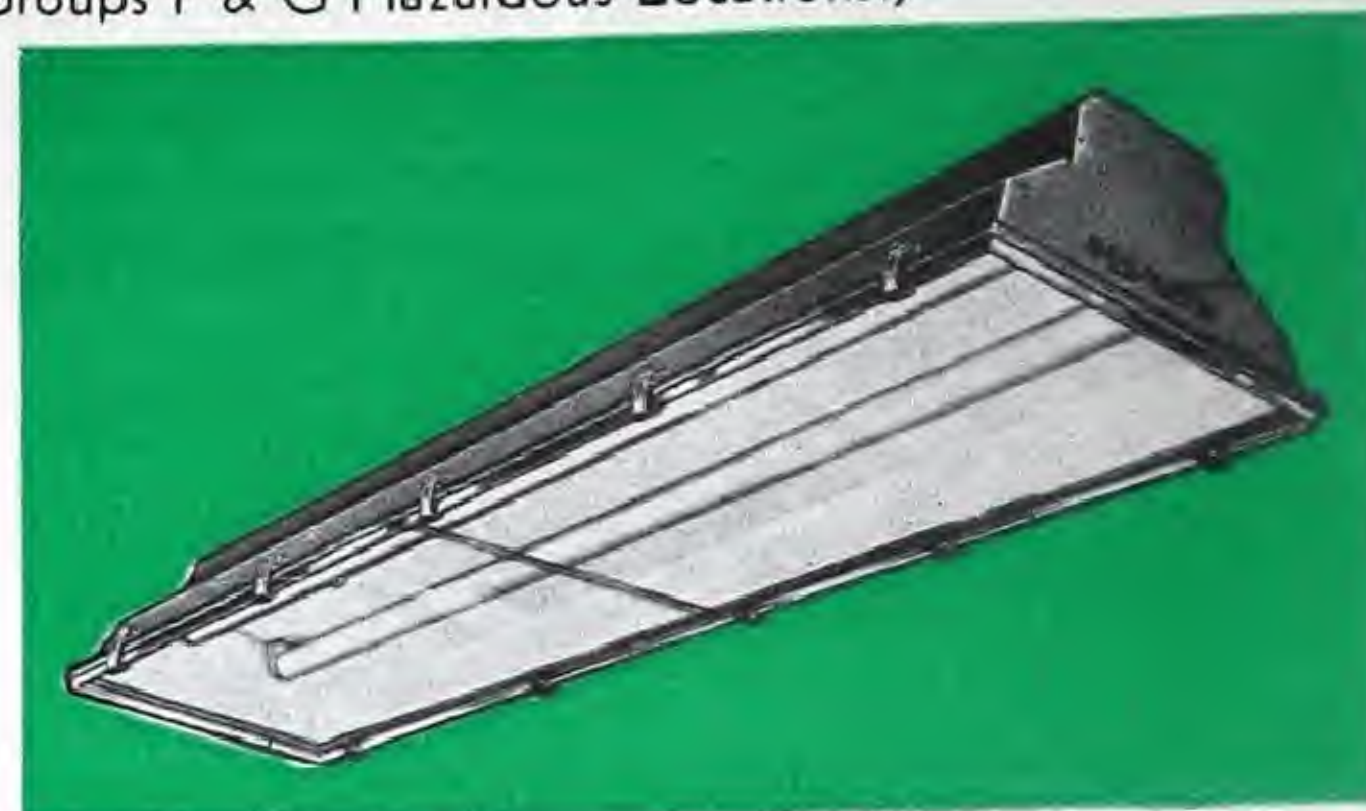
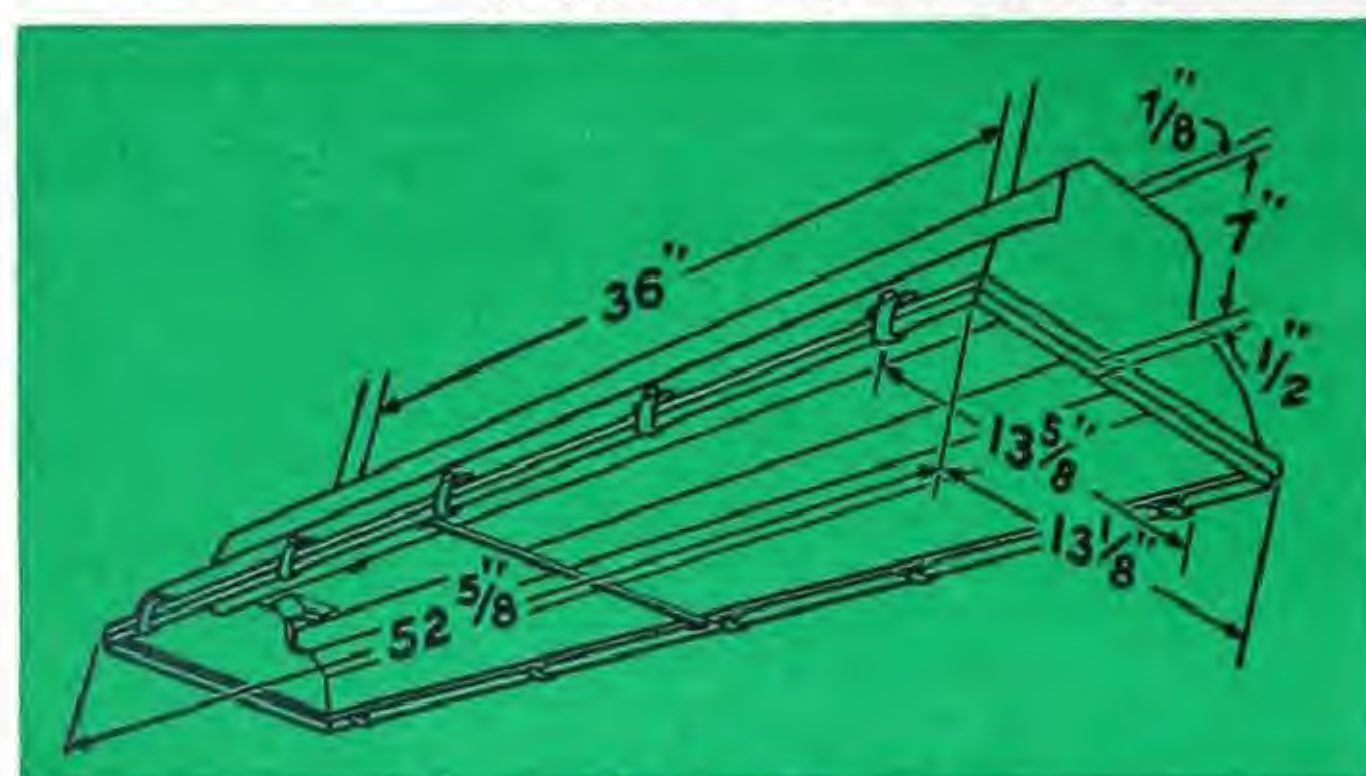
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TROIS RIVIERES	TORONTO	KIRKLAND LAKE	REGINA	VANCOUVER
SHERBROOKE		TIMMINS		VICTORIA



# BENJAMIN DUST-TIGHT FLUORESCENT UNITS

(Approved by Underwriters for Class II Groups F & G Hazardous Locations.)



## Specification of Unit:

**REFLECTOR-HOUSING**—Welded, porcelain enameled steel; with removable porcelain enameled steel plate on the top of which lamp holders and ballast equipment are mounted. The under side of the plate and the sides of the housing form a porcelain enamel reflector with a reflection factor exceeding 79%.

**LIGHT OUTPUT**—The design of the reflector, high reflection factor of the porcelain enamel and other factors combine to give an efficiency of 67% or more of the output of the lamps for twin-lamp units. All units have a 16-degree shielding angle.

**MOUNTING**—Units have two cast-iron suspension flange assemblies with conduit stops, spaced on 36" centers, tapped 1/2" standard; 3/4", if specified. One is for a dummy conduit stem and the other is for wire entrance.

**COVER**—The steel cover frame is hinged to one side of the housing by five steel clamps and steel wire springs which are assembled to straps on the housing and pivot clamps on the frame. The latch arrangements are also made up of five steel clamps and springs, assembled to pivot clamps on the cover frame. The latch side of the housing has straps with hook ends which engage the springs on the latches, when the cover is closed. A dust-tight seal is provided by a special "U" shaped woven asbestos gasket. The gasket and glass are held firmly in the frame by twelve specially designed wire clips. No cement is required to hold the gasket to the glass or the frame.

**FINISH**—Outside finish of the housing is pearl gray porcelain enamel; other exterior metal parts are finished in baked enamel.

FOR USE WITH	CYCLES	CATALOGUE NUMBER WIRED	BALLAST	OVERALL DIMENSIONS, INCHES		
				LENGTH	WIDTH	DEPTH
2—40-watt Lamps	60	49362-CL-60	1 Twin Lamp of 90% P.F.	52 5/8	13 5/8	7 1/2
2—40-watt Lamps	25	49362-CL-25	1 Twin Lamp of 90% P.F.	52 5/8	13 5/8	7 1/2

## Every Fluorescent Installation Should Be Engineered

Northern Electric Branch House Lighting Specialists are available to plan your installation for you. The following are the principal items of information needed to properly design a Fluorescent lighting installation:—

- (a) Type of work to be lighted.
- (b) Length, width and height of area to be lighted.

- (c) Colour (light, medium or dark)—(1) Ceiling.  
(2) Walls.
- (d) Voltage and Cycles of power supply.
- (e) Nature of present lighting system.
- (f) (If possible) A plan of area showing bays, aisles and working areas.

**Northern**  
COMPANY



**Electric**  
LIMITED

A NATIONAL ELECTRICAL SERVICE

HALIFAX  
SAINT JOHN, N.B.  
QUEBEC  
TROIS RIVIERES

SHERBROOKE  
MONTREAL

OTTAWA  
VAL D'OR

TORONTO  
HAMILTON

LONDON  
WINDSOR

KIRKLAND LAKE  
TIMMINS

SAGBURY  
PORT ARTHUR

WINNIPEG  
REGINA

CALGARY

EDMONTON  
VERMILION  
YARMOUTH  
SASKATCHEWAN



Revised March 1948 L-2-1

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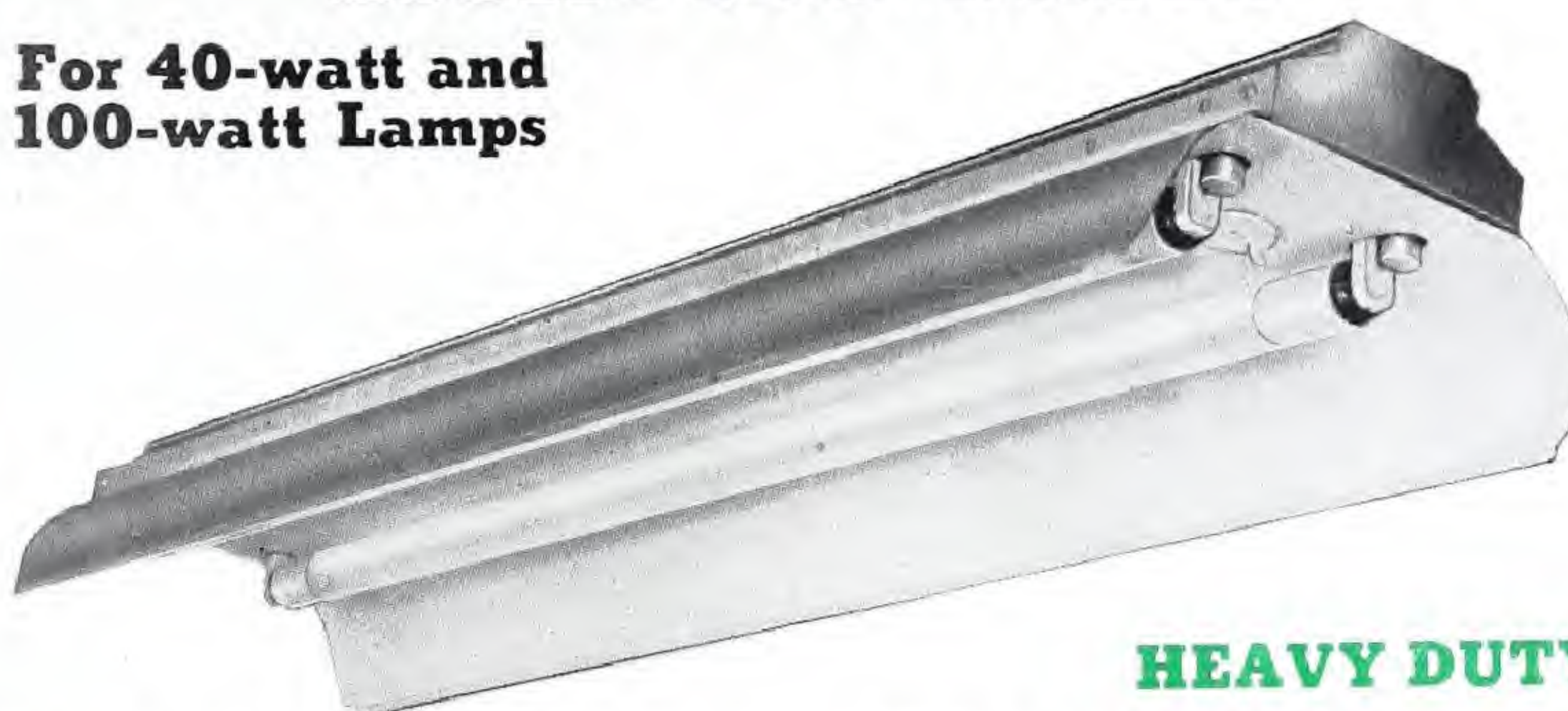


BULLETIN

**Day Brite**

## DAY-LINE RLM FLUORESCENT LIGHTING UNITS

**For 40-watt and 100-watt Lamps**



### HEAVY DUTY TYPE

**Steel Reflectors**—Finished in porcelain enamel consisting of one ground coat and two white coats inside and one ground coat and one gray coat outside. The reflection factor is 79 per cent or more and lateral shielding angle is 13 degrees on 40-watt units and 14 degrees on 100-watt units.

**Servicing Features**—Sockets, lamp starters and ballasts are fastened in the fixture leaving the reflector free for complete removal for servicing and cleaning. The reflector is fastened to the hood by two captive, hand-operated wing nuts which are easily loosened without the use of tools. Lamp starters are located behind the sockets and are easily replaced without disturbing the lamps.

**Wiring and Control Equipment**—Furnished wired and include approved type High Power Factor ballasts, sockets and starters. Lamps and hangers are not included.

**Fixture Hood**—Die-formed steel channel, shaped for increased strength, finished in baked gray enamel.

**Continuous Row Installation**—(see page No. 3) A No. 9950 channel coupling is supplied with each unit to permit continuous row installation of two or more units.

**Accessories**—Wire bale type lamp guards or steel louvres can be furnished for installation on these units. See listing next page.

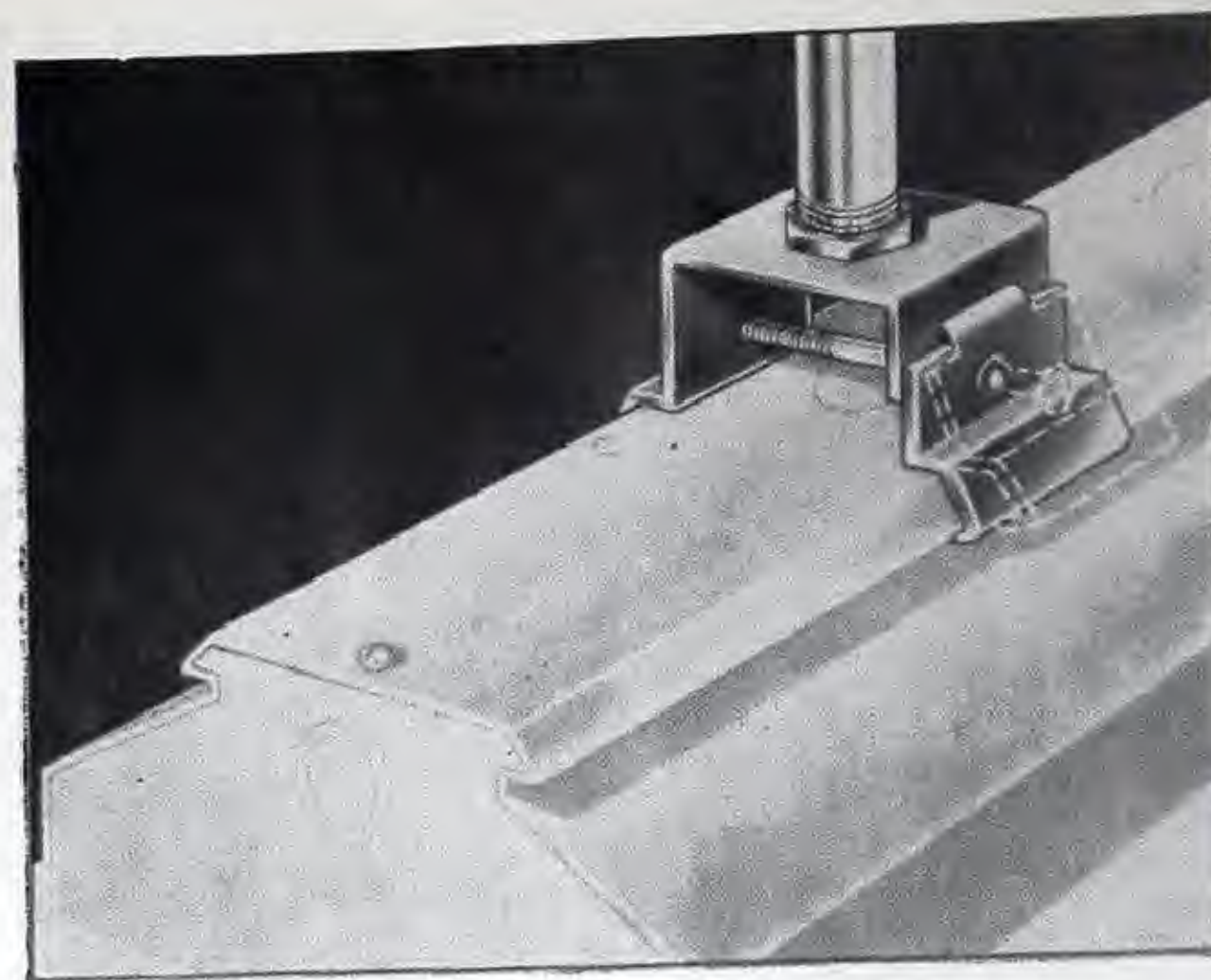
**Approved by the Canadian Standards Association**

FOR LAMPS		Cycles	CATALOGUE NUMBER		OVERALL DIMENSIONS			Approx. Shipping Weight Lbs.
No.	Size		Porcelain Enamel	Baked Enamel	Height	Width	Length	
FOR TWO 40-WATT LAMPS								
2	48"-40 watts—110 volts	60	40231BW-60	40261BW-60	7"	13 $\frac{1}{4}$ "	52 $\frac{3}{4}$ "	30
2	48"-40 watts—110 volts	66 $\frac{2}{3}$	40231BW-66	40261BW-66	7"	13 $\frac{1}{4}$ "	52 $\frac{3}{4}$ "	30
2	48"-40 watts—110 volts	25	40231BW-25	40261BW-25	7"	13 $\frac{1}{4}$ "	52 $\frac{3}{4}$ "	40
FOR THREE 40-WATT LAMPS								
3	48"-40 watts—110 volts	60	40331BW-60	40361BW-60	7"	13 $\frac{1}{4}$ "	52 $\frac{3}{4}$ "	34
FOR TWO 100-WATT LAMPS								
2	60"-100 watts—110 volts	60	50231BW-60	50261BW-60	8 $\frac{1}{8}$ "	16 $\frac{1}{4}$ "	66"	50



## "ICE-TONG" HANGER CLAMPS

It is unnecessary to "spot" exact locations for mounting hangers or conduit when using these Day-Brite "Ice-Tong" hanger clamps. They can be positioned at any point in the entire length of the channel and are permanently held by turning down one screw.



Cat. No.	Description	Wt. Lbs.
9952-A	"Ice-Tong" Hanger Clamp for $\frac{3}{8}$ " rod or mtg. screws.....	1
9952-B	"Ice-Tong" Hanger Clamp for $\frac{1}{2}$ " conduit pipe hangers.....	1
9952-C	"Ice-Tong" Hanger Clamp for $\frac{3}{8}$ " iron pipe hangers.....	1



## PARTS AND FITTINGS

Cat. No.	Description	Wt. Lbs.
*9950	Channel Coupling.....	$\frac{1}{2}$
*9951	Channel End Cap.....	$\frac{1}{4}$
9953	Cable Clamp for messenger cable mounting.....	1
9956	Ceiling Strap ( $\frac{3}{8}$ " mtg. holes, $8\frac{1}{2}$ " O.C.).....	$\frac{1}{2}$
9957-A	Hanger Strap for $\frac{3}{8}$ " rod.....	$\frac{1}{4}$
9957-B	Hanger Strap for $\frac{1}{2}$ " conduit pipe hangers.....	$\frac{1}{4}$
9957-C	Hanger Strap for $\frac{3}{8}$ " iron pipe hangers.....	$\frac{1}{4}$
9963	One Pair 5-ft. Chain Hangers and "S" Hooks.....	$\frac{1}{2}$
9972	Ceiling Canopy—Slips $\frac{1}{2}$ " iron pipe.....	$\frac{1}{2}$
9982	One Pair Lamp Guards for 40-watt fixtures.....	$\frac{1}{4}$
9983	One Pair of Lamp Guards for 100-watt fixtures.....	$\frac{1}{4}$
7724	Steel Louvre for 40-watt fixtures (Baked Finish).....	12
7725	Steel Louvre for 100-watt single fixture (Baked Finish).....	16

\*Included with all units.

"Ice Tong" Clamps and all other parts and fittings are ordered separately.

# Northern Electric

COMPANY LIMITED

HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
 KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
 PORT ARTHUR WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA



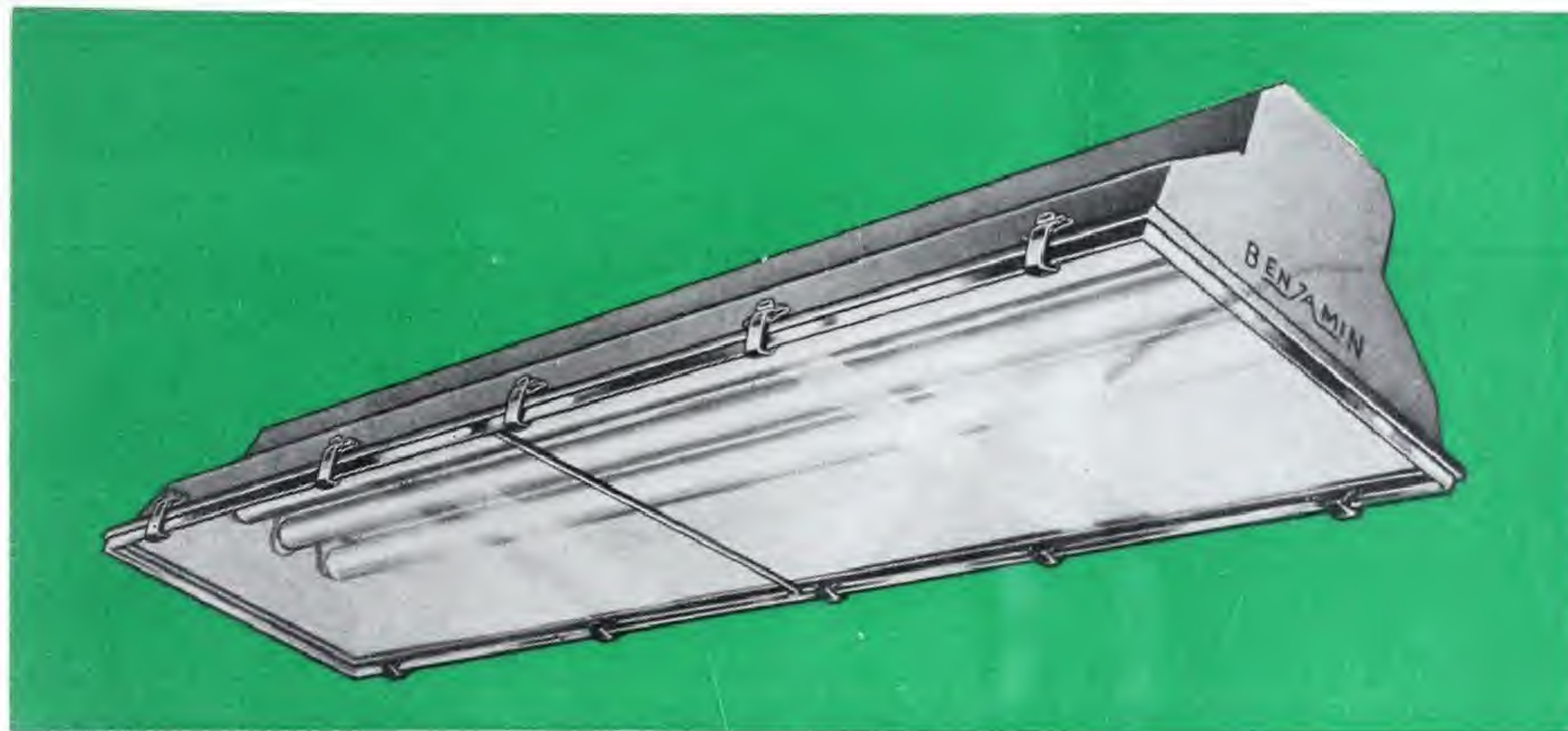


NOR-ELECTRIC



BULLETIN

## Benjamin "Sealed-Flo 48" Dust Tight Units



Approved by Canadian Standards Association

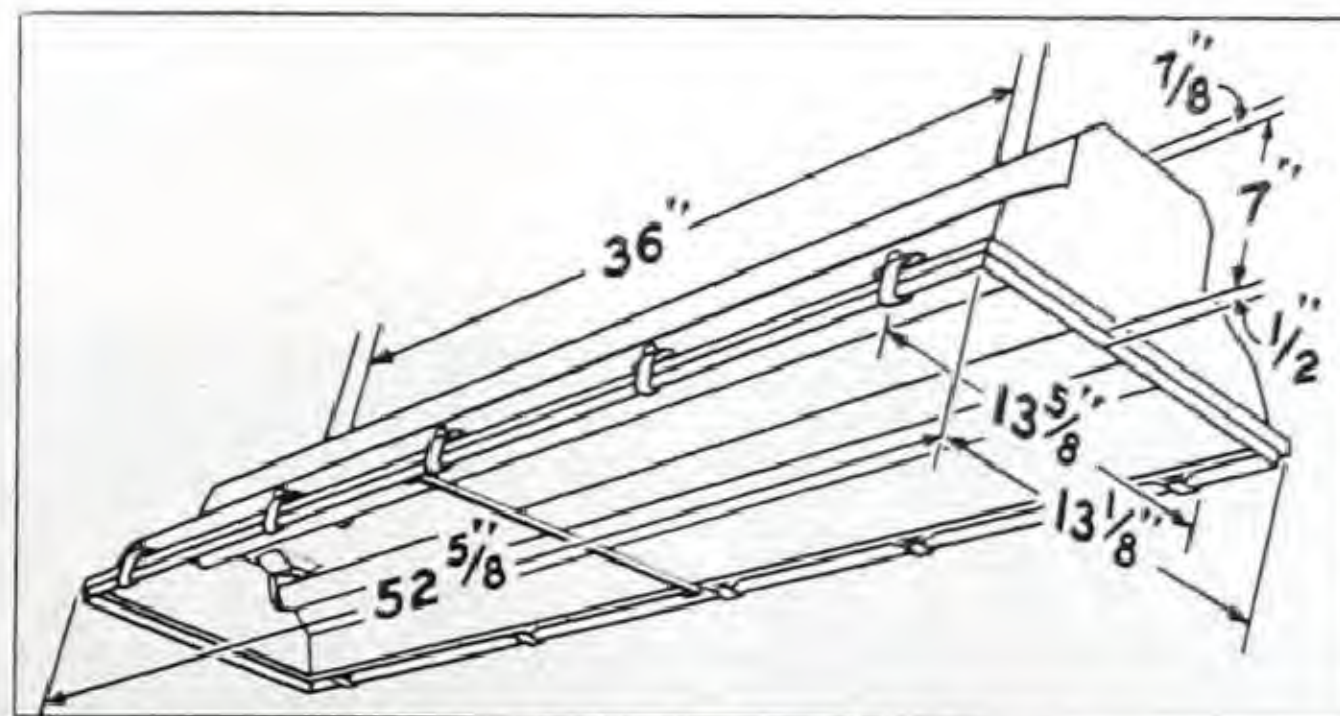
### SUITABLE FOR DAMP LOCATIONS

They are available in arrangements for either two or three 48-inch, Fluorescent lamps. In general lighting installations twin-lamp "Sealed-Flo 48" units provide lighting levels ranging from 17 to 42 footcandles at normal mounting and spacing. Triple-lamp units provide lighting levels ranging from 22 to 52 footcandles at normal mounting and spacing.

These units can also be used for local lighting of inspection tables, production lines and machines. Mounted 30 to 36 inches above the surface to be lighted and equipped with "white" lamps, the twin-lamp unit can provide lighting levels up to 85 footcandles. Under similar conditions, the triple-lamp unit can provide up to 115 footcandles.

### Special Glass Covers

These new units, when equipped with impact-resisting tempered plate glass covers, are valuable in the food industry, where there is danger of spoilage from the possible breakage of lamps or of ordinary glass covers.



Dimensions of Twin and Triple-Lamp Units

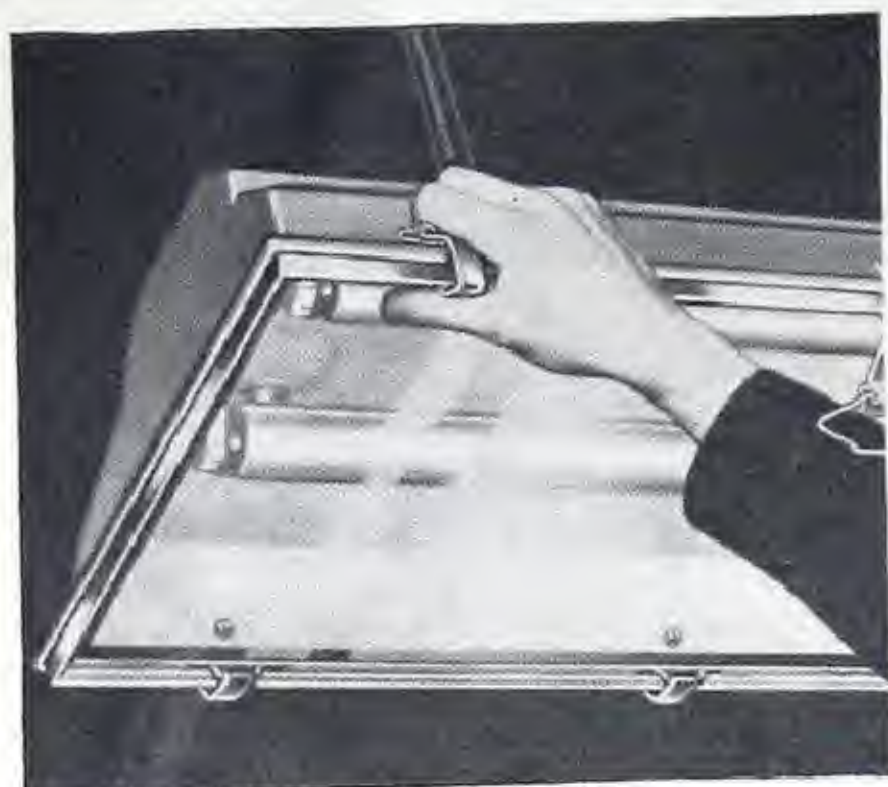
### Reduce Cleaning Costs

There are many other locations requiring these units, where hazardous atmospheric conditions are not present but where proper maintenance is the important problem. In such cases, the sealed construction protects lamps and reflecting surfaces from dust and dirt so that efficiency is easily maintained and cleaning costs reduced.

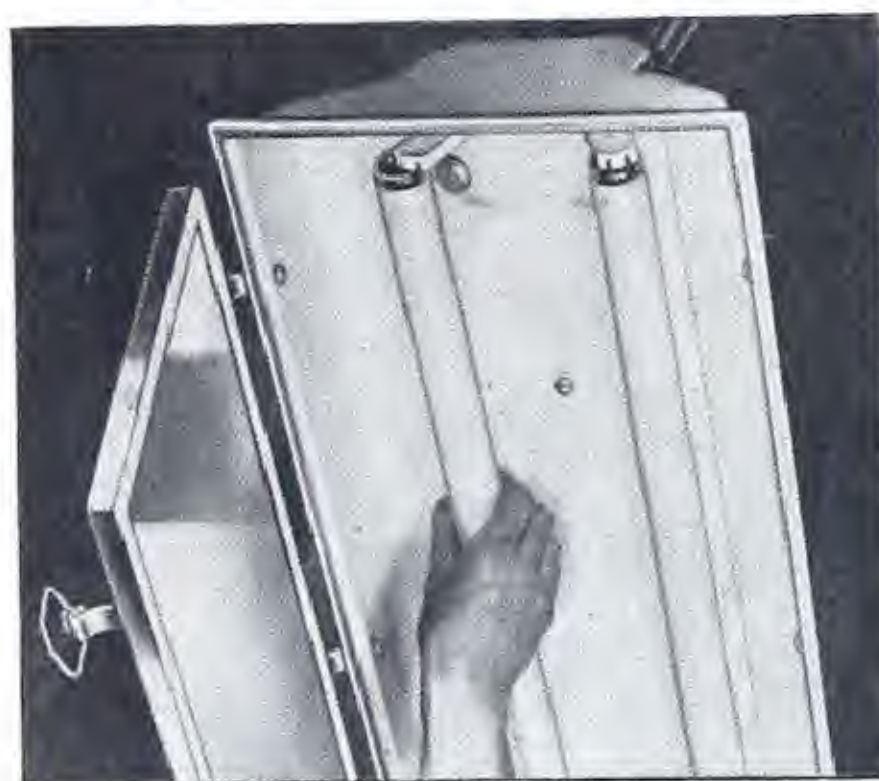


## Benjamin "Sealed-Flo 48" Dust Tight Units

### SPECIFICATIONS



Cover clamps are easily opened for servicing.



Cover hangs straight down for easy access.

**Reflector-Housing**—Welded, porcelain enameled steel; with removable porcelain enameled steel plate on the top of which lamp holders and ballast equipment are mounted. The under side of the plate and the sides of the housing form a porcelain enamel reflector with a reflection factor exceeding 79%.

**Cover**—The steel cover frame is hinged to one side of the housing by five steel clamps and steel wire springs which are assembled to straps on the housing and pivot clamps on the frame. The latch arrangements are also made up of five steel clamps and springs, assembled to pivot clamps on the cover frame. The latch side of the housing has straps with hook ends which engage the springs on latches, when the cover is closed.

A dust-tight seal is provided by a special "U" shaped woven asbestos gasket. The gasket and glass are held firmly in the frame by twelve specially designed wire clips. No cement is required to hold the gasket to the glass or the frame.

**Light Output**—The design of the reflector, high reflection factor of the porcelain enamel and other factors combine to give an efficiency of 67% or more of the output of the lamps for twin-lamp units and 61% or more for triple-lamp units. All units have a 16-degree shielding angle.

**Guarantee**—Benjamin lighting units, when properly installed and under normal conditions of use, are guaranteed against mechanical and electrical defects for a period of one year from date of delivery to the purchaser with the exception of the lamp starters for which the guarantee is limited to a period of 90 days. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee.

**Ballasts**—Twin-lamp units are supplied with either conventional type ballasts which require individual starters for each lamp or Instant-starting ballasts which do not require starters. Triple-lamp units are supplied with conventional type ballasts and individual lamp starters only.

**Starters**—Regularly supplied with No-Blink type starters (FS 40). Starters are accessible from inside the unit for easy replacement.

**Provision for Grounding**—Metal to metal bonds ground unit through conduit system.

**Mounting**—Units have two cast iron suspension flange assemblies with conduit stops, spaced on 36-inch centres, tapped 1/2-inch standard; 3/4-inch, if specified. One is for a dummy conduit stem and the other is for wire entrance.

**Finish**—Outside finish of the housing is pearl gray porcelain enamel; other exterior metal parts are finished in baked enamel.

### "SEALED-FLO" UNITS FOR TWO 48-INCH, T-12 (40-WATT) FLUORESCENT LAMPS With Double Strength Grade "A" Clear Glass Cover\*

Catalogue Number	No. of Lamps	Line Voltage†	Cycles‡	Ballast	Approx. Wgt., Lbs.
49362-CL-60	2	110V-125V	60	2 Lamp	39
49362-CL-25	2	110V-125V	25	2 Lamp	47
49363-CL-60	3	110V-125V	60	3 Lamp	43

†Units supplied with 199-216V conventional ballasts at same prices as 110-125V conventional ballasts.

\*Heat and impact-resisting, tempered plate, clear glass covers supplied, when specified, at slight advance in list price, per unit. To order, substitute "TP" for "CL" in catalogue number.

‡Units supplied with 50 cycle conventional type ballasts on special order at prices quoted upon application.

2-lamp units with conventional ballasts use approximately 100 watts; 3-lamp units, approximately 150 watts; 2-lamp units with instant-starting ballasts use approximately 110 watts.

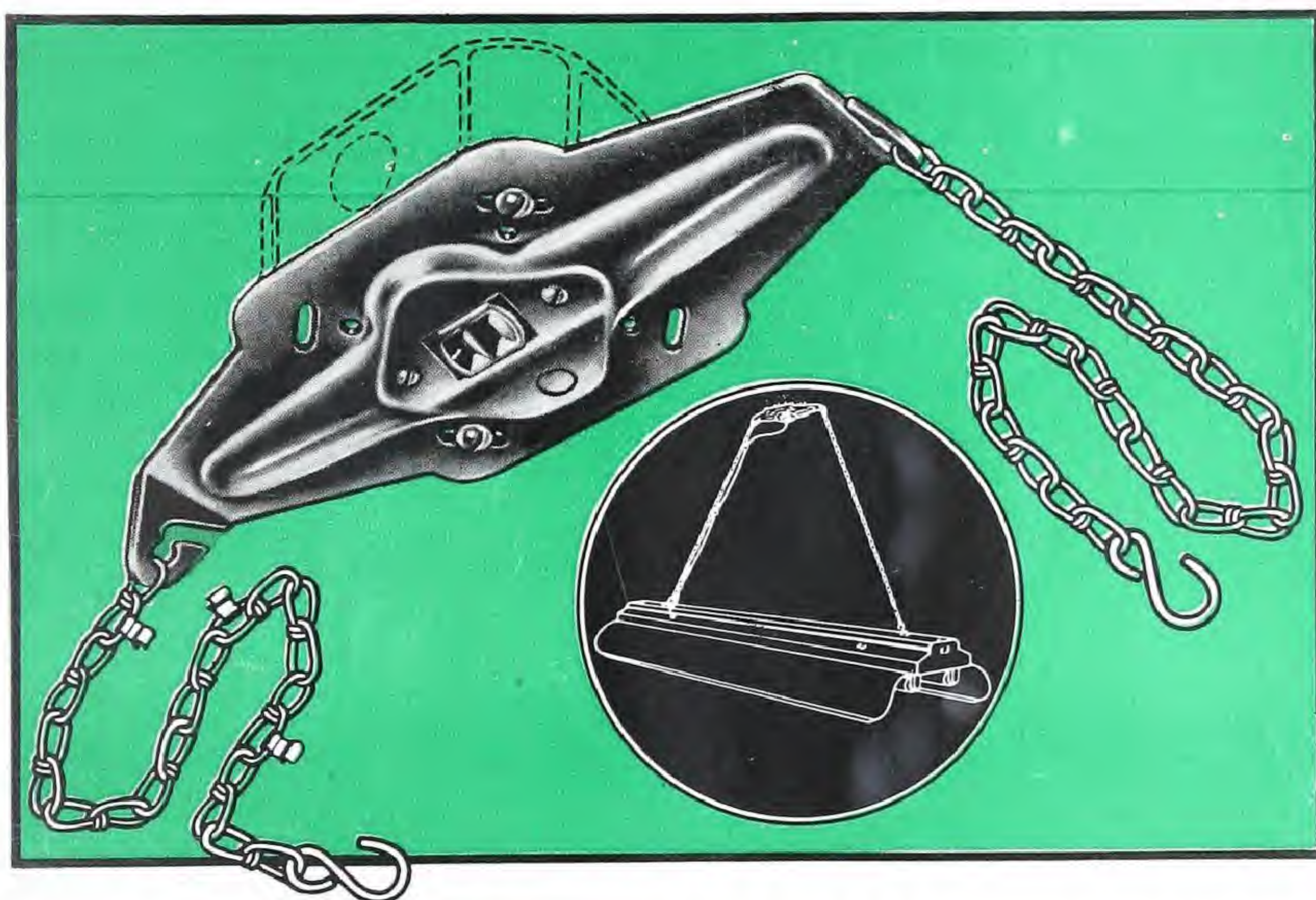
# Northern Electric

COMPANY LIMITED

HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA  
VAL D'OR TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
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**NOR-ELECTRIC****BULLETIN***The Day-Brite***HYDEE HANGER****For All Chain Suspension Industrial Units**

**Easy and Speedy to Install . . .** Simply make wiring connections—screw the hanger to the outlet box—then hang the fixture . . . no toggle bolts or other fastening arrangements necessary.

**Simplifies Fixture Maintenance . . .** In case of trouble, entire fixture can be quickly removed . . . a replacement installed . . . and the defective unit repaired at leisure.

**Versatile . . .** Fits on standard 4" or 3½" outlet box or plaster ring.

**More than Adequate Support . . .** E.T.L. Tests

show that screws on outlet box ears will support sustained weight of over 1000 lbs. Chain hangers are rated at 320 lbs. per chain.

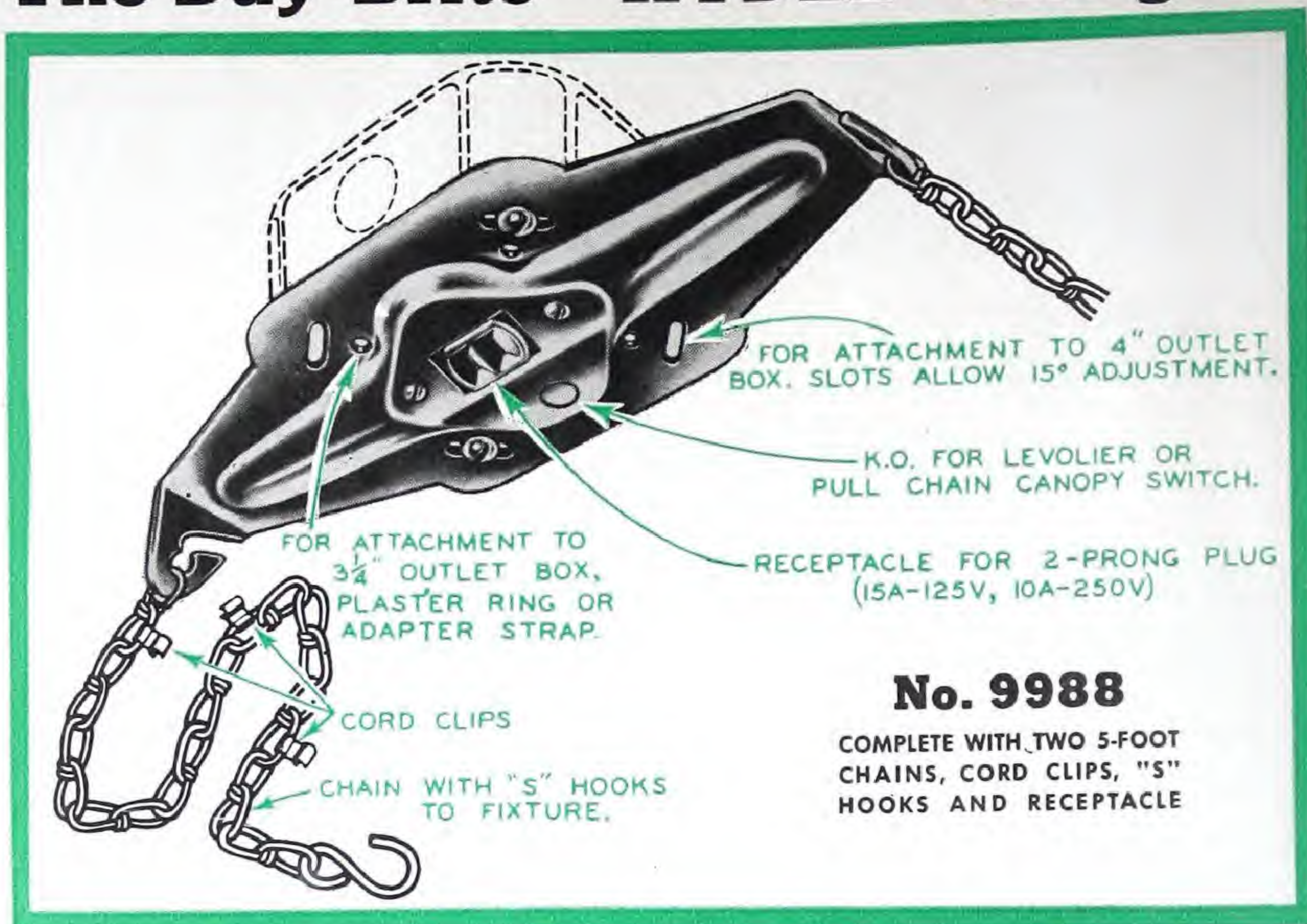
**Complete . . .** The HYDEE hanger is furnished complete including receptacle for two-prong plug, two 5-ft. chains, "S" hooks and cord clips. Nothing more is required for the speedy installation of standard fixtures arranged for chain suspension and furnished with two-wire cord and plug.

The hanger plate is finished in baked aluminum enamel with chains, "S" hooks and cord clips in a rust-proofed finish.



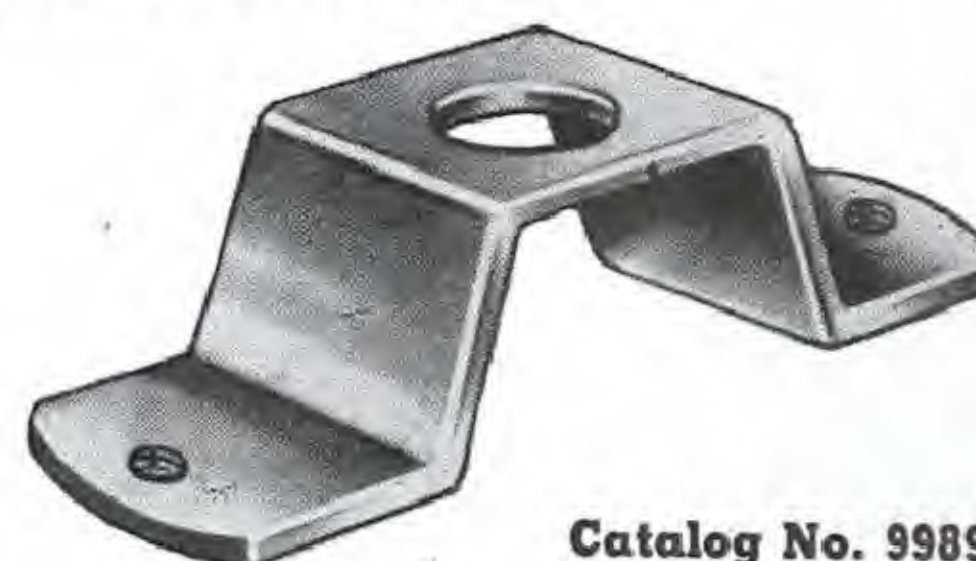
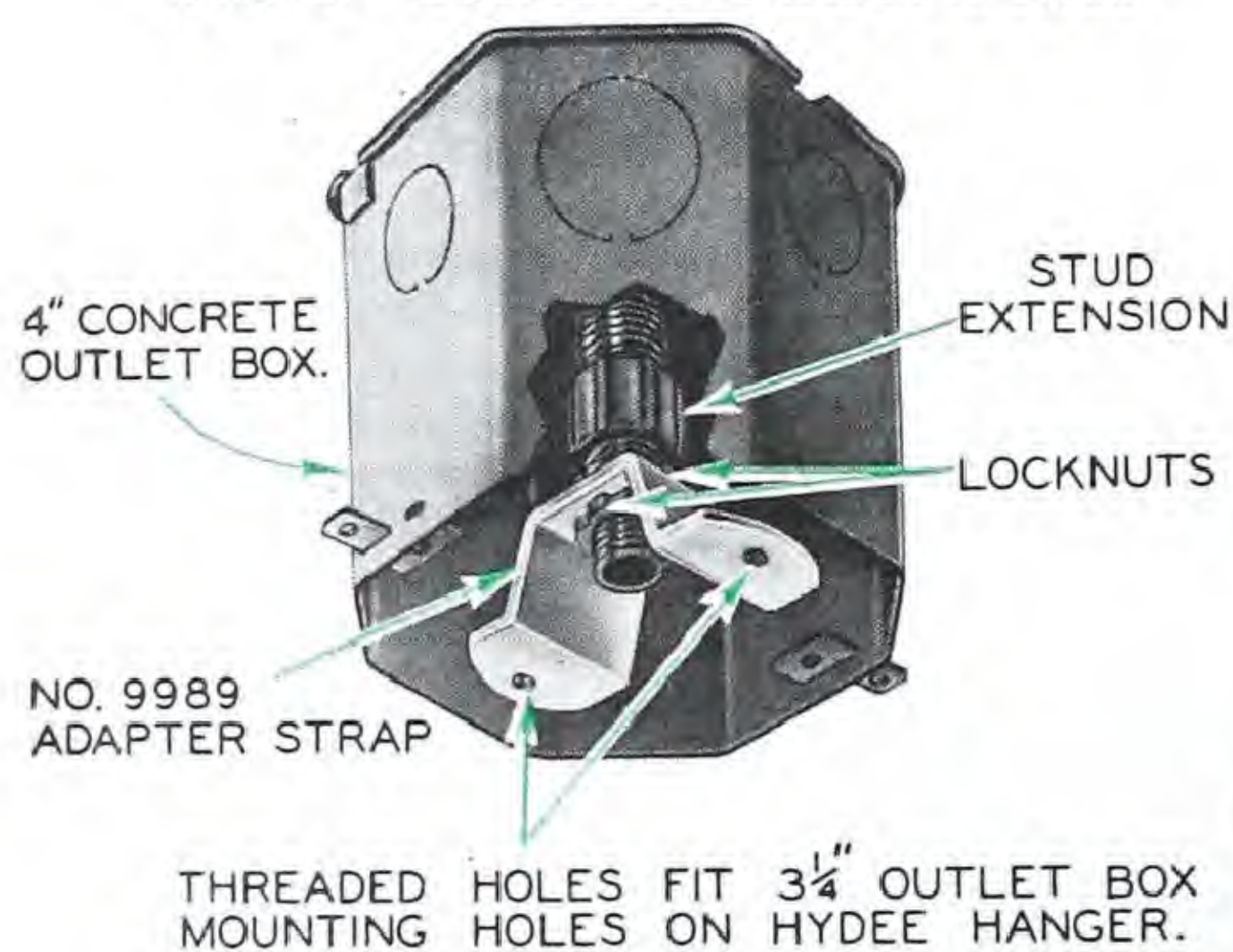
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## The Day-Brite "HYDEE" Hanger



## "HYDEE" ADAPTER STRAP

For 4" Concrete Outlet Boxes



Steel Adapter Strap has hole in centre for 3/8" fixture stud and 8-32 tapped holes in ends for HYDEE hanger screws.

For 4" concrete outlet box installations, use with 3/8" fixture stud and stud extension to provide adjustment to all angles for lining up fixtures.

Can also be used for stud attachment in standard 4" outlet boxes over 1 1/2" in depth.

Approved by the Canadian Standards Association

**Northern Electric**  
COMPANY LIMITED

HAUFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
PORT ARTHUR WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA





NOR-ELECTRIC



BULLETIN

# Industrial Reflectors



*The Benjamin  
Line*

- PORCELAIN ENAMELLED STEEL REFLECTORS
- REFLECTOR FITTINGS

These reflectors are of steel, finished in finest quality multiple coat porcelain enamel of high reflecting efficiency. This finish offers effective resistance to fumes, moisture and grime. The reflectors can be readily cleaned and the surface does not deteriorate.



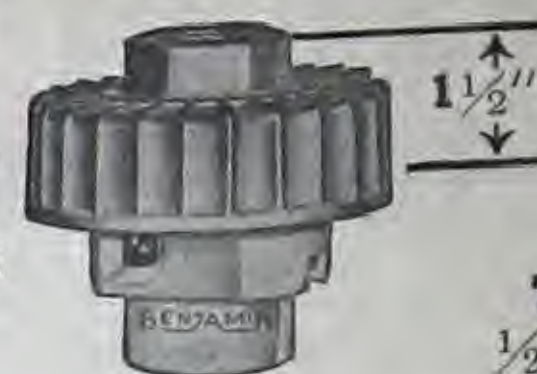
## "Shall-O-Hood" Reflectors

"Shall-O-Hood" Reflectors combine the popular threaded-neck type of reflector construction with a new and exceptionally easy-to-wire hood design which makes possible marked economies in installation.

The basis of this design is the shallow construction of the hood and the use of accessible, side-terminal sockets. In wiring, it is not necessary to remove the socket from the hood to make connections to the terminal screws.

### PENDENT CAST HOOD

Comp.  
with  
Socket



Tap.  
1/2" Std.

Cat. No.	Socket Description
3500	Medium No. 44
3505	Mogul No. 244

Complete with Hood, Socket and Reflector

### RLM DOME UNITS

Lamp Watts	Cat. No.	*Shpg. Wt. Lbs.
100	3701	33
200	3703	48
300, 500	3704	41
750-1500	3705	50

### SHALLOW DOME UNITS

Lamp Watts	Cat. No.	*Shpg. Wt. Lbs.
75, 100	3765	32
200	3722	45

### RLM BOWL UNITS

Lamp Watts	Cat. No.	*Shpg. Wt. Lbs.
100	3733	28
200	3734	37

### RLM SYMM. ANGLE UNITS

Lamp Watts	Cat. No.	*Shpg. Wt. Lbs.
100	3776	29
200	3749	49
300, 500	3750	38

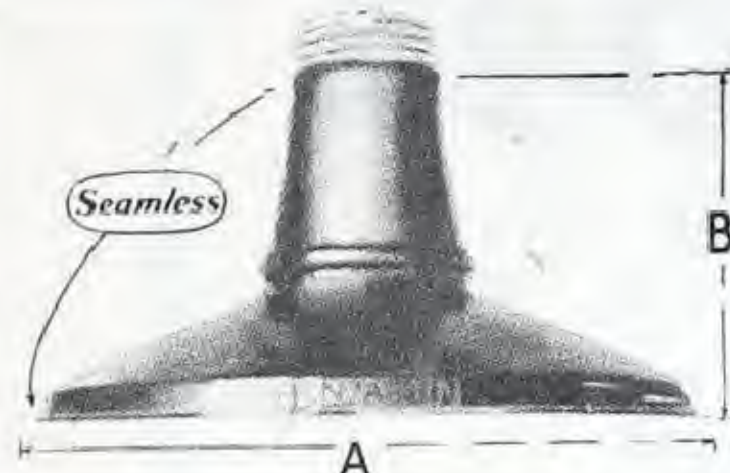
### Reflectors Only

#### RLM DOME REFLECTORS



Lamp Watts	Cat. No.	Dia. Inch. "A"	Ht. Inch. "B"
100	37012	12	6 5/8
200	37016	16	9
300, 500	37018	18	10 3/4
750-1500	37020	20	13 1/2

#### SHALLOW DOME REFLECTORS



Lamp Watts	Cat. No.	Dia. Inch. "A"	Ht. Inch. "B"
75, 100	37412	12	6 1/8
200	37416	16	8 1/4

#### RLM BOWL REFLECTORS



Lamp Watts	Cat. No.	Dia. Inch. "A"	Ht. Inch. "B"
100	37108	8	7 1/8
200	37110	10	9 1/4

#### RLM SYMM. ANGLE REFLECTORS



Lamp Watts	Cat. No.	Dia. Inch. "A"	Ht. Inch. "B"
100	37208	8	8 1/4
200	37212	12	12 7/8
300, 500	37214	14	15 5/8

\*Weight standard package. Standard package is 10 on medium and 5 on mogul hood, reflector assemblies.

## Shallow Bowl Reflector

WITH NECK TO FIT STANDARD SHADE HOLDERS



Cat. No. H412

Catalogue Number	Dia. in In., Reflector	Size in In., Holder	Ship. Wt. Std. Pkg.	Stand. Package
H412	12	2 1/4	18	10
H414	14	2 1/4	25	10



## "Shall-O-Hood" Reflectors, cont'd

A complete unit consists of either of the two hoods shown at the right of this page and page 2, in combination with the reflectors listed below each illustration.

Hood—Regularly supplied with keyless, rigid socket.

Pendent hoods tapped 1/2-inch standard; 3/4-inch when specified. Ceiling hood fits 3 1/2 and 4-inch standard outlet boxes.

Finish—Hood is electroplated; reflectors are porcelain enamelled steel, green outside; reflecting white inside.

### CEILING CAST HOOD

Comp.  
with  
Socket



Fits 3 1/2 and 4"  
Outlet Boxes

Cat. No.	Socket Description
3550	Medium No. 44
3555	Mogul No. 244

### Complete with Hood, Socket and Reflector

#### RLM DOME UNITS

Lamp Watts	Cat. No.	*Shpg. Wt. Lbs.
100	3711	38
200	3713	53
300, 500	3714	43
750-1500	3715	52

#### SHALLOW DOME UNITS

Lamp Watts	Cat. No.	*Shpg. Wt. Lbs.
75, 100	3771	37
200	3728	50

#### RLM BOWL UNITS

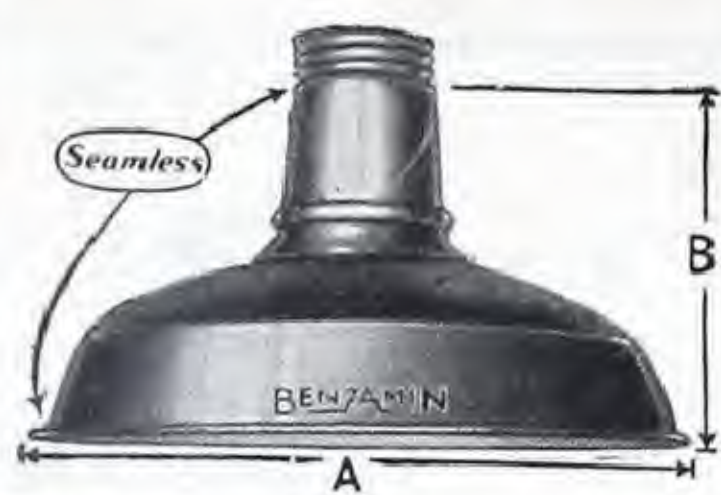
Lamp Watts	Cat. No.	*Shpg. Wt. Lbs.
100	3741	33
200	3742	42

#### RLM SYMM. ANGLE UNITS

Lamp Watts	Cat. No.	*Shpg. Wt. Lbs.
100	3779	34
200	3755	54
300, 500	3756	40

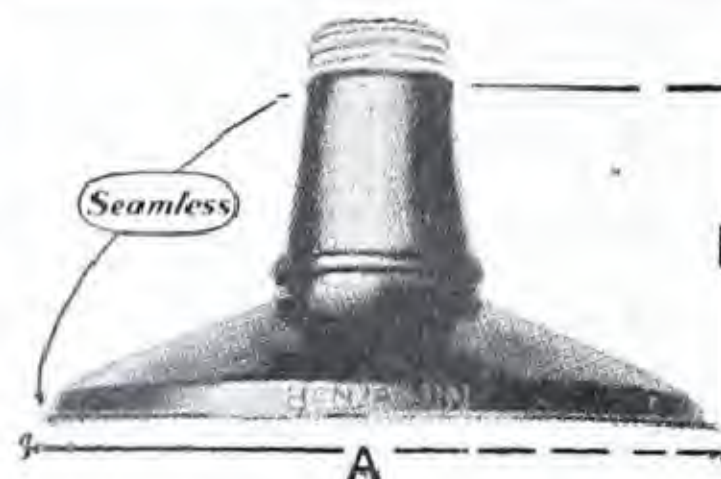
### Reflectors Only

#### RLM DOME REFLECTORS



Lamp Watts	Cat. No.	Dia. Inch. "A"	Ht. Inch. "B"
100	37012	12	6 5/8
200	37016	16	9
300, 500	37018	18	10 3/4
750-1500	37020	20	13 1/2

#### SHALLOW DOME REFLECTORS



Lamp Watts	Cat. No.	Dia. Inch. "A"	Ht. Inch. "B"
75, 100	37412	12	6 1/8
200	37416	16	8 1/4

#### RLM BOWL REFLECTORS



Lamp Watts	Cat. No.	Dia. Inch. "A"	Ht. Inch. "B"
100	37108	8	7 1/8
200	37110	10	9 1/4

#### RLM SYMM. ANGLE REFLECTORS



Lamp Watts	Cat. No.	Dia. Inch. "A"	Ht. Inch. "B"
100	37208	8	8 1/4
200	37212	12	12 7/8
300, 500	37214	14	15 5/8

\*Weight standard package. Standard package is 10 on medium and 5 on mogul hood, reflector assemblies.

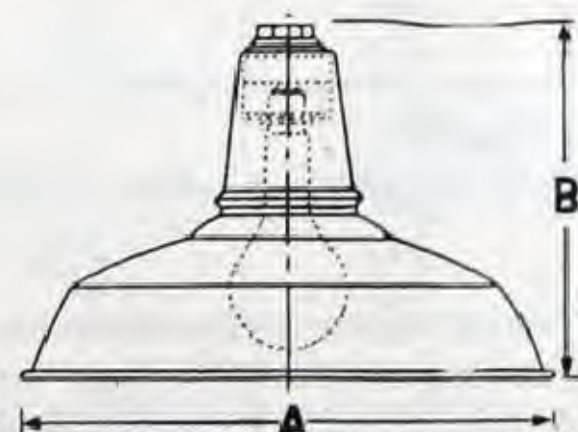
## "X Type" Porcelain Enameled Reflectors

### COMPLETE WITH SOCKET

#### Style of Reflector



"X" Type  
RLM Dome







Lamp Watts	Cat. No.	Dimensions A	B	Std. Pkg.	Ship. Wt. Lbs.
100	5641	12	8 1/4	10	35
200	5643	16	10 1/2	10	50
300-500	5644	18	12 1/4	5	35
750-1500	5645	20	15 1/8	5	45



# "X Type" Porcelain Enameled Reflectors, cont'd

COMPLETE WITH SOCKET

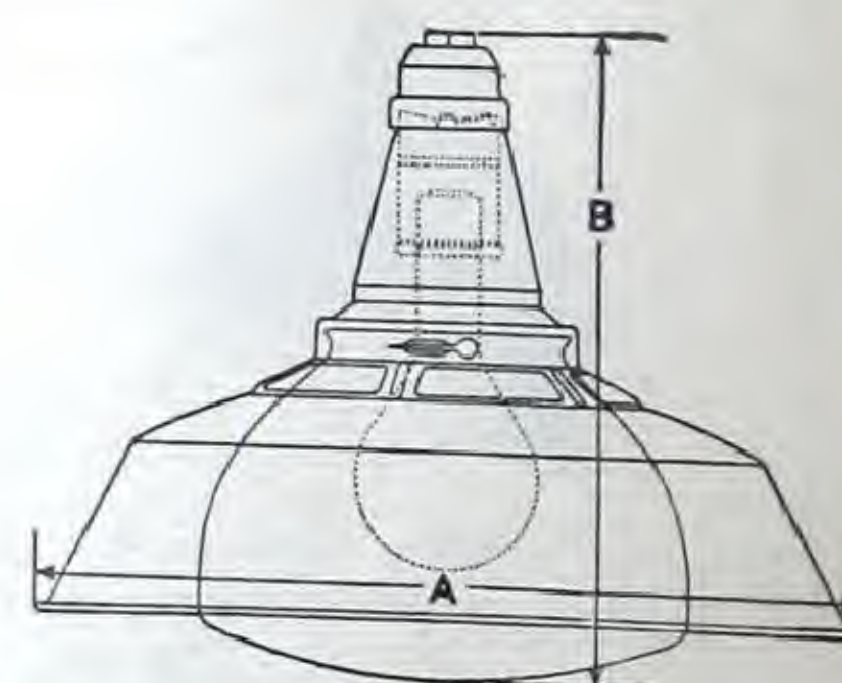
Style of Reflector	Lamp Watts	Cat. No.	Dimensions A B		Std. Pkg.	Ship. Wt. Lbs.
 <b>"X Type" Shallow Dome</b>	75-100	5421	12	7 $\frac{3}{4}$	10	35
	200	5425	16	9 $\frac{3}{4}$	10	50
 <b>"X Type" RLM Deep Bowl</b>	100	6161	8	8 $\frac{5}{8}$	10	30
	200	6169	10	10 $\frac{3}{4}$	10	35
 <b>"X Type" RLM Symmetrical Angle</b>	100	5541	A. 8	B. 10 $\frac{1}{4}$	C. 7	10 25
	150	5542	10	12	8 $\frac{3}{4}$	10 35
	300-500	5543	14	17 $\frac{5}{8}$	12 $\frac{1}{2}$	5 30
 <b>"X Type" Elliptical Angle</b>	†75-100	5522	12 $\frac{3}{4}$	13	9 $\frac{1}{8}$	10 35
	150	5525	12 $\frac{3}{4}$	13 $\frac{7}{8}$	9 $\frac{1}{8}$	10 40
	200	5526	16 $\frac{1}{4}$	15 $\frac{5}{8}$	11 $\frac{1}{2}$	10 53
	300-500	*5537	20	19 $\frac{3}{8}$	14 $\frac{3}{4}$	5 45
	750-1500	*5538	21 $\frac{7}{8}$	21 $\frac{1}{2}$	14 $\frac{7}{8}$	5 55

\*Standard tapping  $\frac{3}{4}$ ". If specified,  $\frac{1}{2}$ " tapping can be supplied at no extra charge.  
†Takes 60 watt lamp if socket extension used.



## "Turnlox" Glassteel Diffuser

COMPLETE WITH HOOD, REFLECTOR AND GLOBE



WITH PENDENT HOOD						OPAL GLOBE ONLY	
Pendent Hoods are cast iron tapped $\frac{1}{2}$ inch, standard; $\frac{3}{4}$ inch, if specified.						Cat. No.	Diameter
Size of Lamp, Watts	With Opal Glass	With Daylight Glass	Dim. in Inches		Ship. Wt. Std. Pkg.	26347	10"
	Catalogue No.	Catalogue No.	Diam. "A"	Height "B"			
*150, 200	7201	7226	18	13 $\frac{1}{8}$	50	26349	12"
300, 500	7202	7227	20	15 $\frac{3}{8}$	64		
WITH CEILING TYPE HOOD						DAYLIGHT GLOBE ONLY	
Ceiling type hoods are of cast iron and fit 4 inch standard Outlet Boxes.						26346	10"
Size of Lamp, Watts	Catalogue No.	Catalogue No.	Dim. in Inches	Ship. Wt. Std. Pkg.			
*150, 200	9201	9226	18	12 $\frac{3}{4}$	52	26348	12"
300, 500	9202	9227	20	15	66		
Standard Package is 4 on 18" and 20" units and 2 on 24".							
*When using 150 watt lamp, Socket Extension No. 91 must be used to correctly position lamp in reflector.							



## "Turnlox" Reflectors

"Turnlox" Reflectors are listed below in assemblies for conduit or outlet box mounting. Catalogue numbers are given for the complete units and for the hoods when ordered separately. Pendant hoods are ordinarily supplied tapped for  $\frac{1}{2}$ " pipe, but will be supplied tapped for  $\frac{3}{4}$ " pipe, if specified, at no extra charge.

### NO. 7 PENDENT HOOD With Socket








For  $\frac{1}{2}$ -inch Pipe

### NO. 9 OUTLET BOX HOOD With Socket



For 4" Outlet Boxes



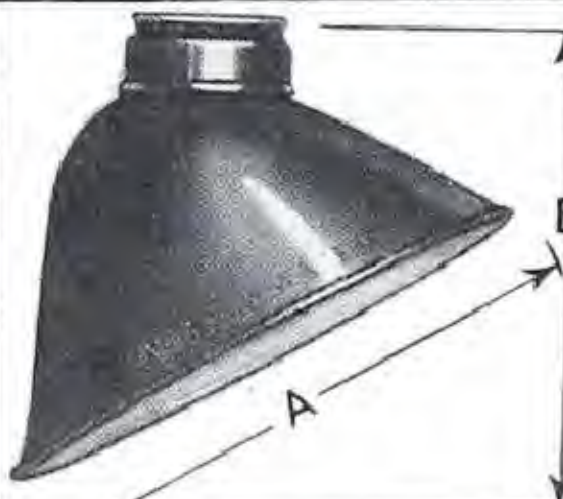
Style of Reflector	Lamp Watts	Dimensions A.      B.			Std. Pkg.	Cat. No.	Ship. Wt. Lbs.	Cat. No.	Ship. Wt. Lbs.
					10	No. 7	12	No. 9	17
		Complete with Hood, Socket and Reflector							
 "Turnlox" RLM Dome	100 200 300-500 750-1500	12 16 18 20	7 1/4 9 1/2 11 1/4 14 1/8	10 10 5 5	7641 7643 7644 7645	42 56 43 54	9641 9643 9644 9645	45 59 46 57	
 "Turnlox" Shallow Dome	75-100 200	12 16	6 3/4 8 3/4	10 10	7421 7425	40 55	9421 9425	43 58	
 "Turnlox" RLM Deep Bowl	60 100 200	7 8 10	6 3/8 7 5/8 9 7/8	10 10 10	7166 7161 7169	32 35 44	9166 9161 9169	37 41 49	
 "Turnlox" Elliptical Angle	75-100 200 300-500 750-1500	A. 12 3/4 16 1/4 20 21 1/8	B. 12 14 5/8 18 3/8 20 1/2	C. 9 1/8 11 1/2 14 3/4 14 7/8	10 10 5 2	7522 7526 7537 7538	52 66 1/2 44 29	9522 9526 9537 9538	55 69 1/2 49 30
 "Turnlox" RLM Symmetrical Angle	100 150 300-500	A. 8 10 14	B. 9 1/4 11 16 5/8	C. 7 8 3/4 12 1/2	10 10 5	7541 7542 7543	33 41 1/2 35	9541 9542 9543	36 44 1/2 38



## Shadeholder Reflectors

Benjamin Porcelain Enamelled Shadeholder Reflectors are supplied in the types of reflectors listed below and with the types of shadeholders listed to the right.

Finish of reflectors is green porcelain enamel outside, white porcelain enamel inside.

Style of Reflector	Lamp Watts	Dimensions A. B.	Ship. Wt.	Std. Pkg.	Type N Neck For 2 1/4-inch Shadeholders Catalogue Number	Type B Holder For Brass Shell Sockets Catalogue Number	Type P Holder For Porcelain Sockets Catalogue Number
 RLM Dome	100	12" 5 1/2"	19 1/2	10	14075N	14075B	14075P
	200	16" 7 3/4"	36	10	14200N	14200B	14200P
 Deep Bowl	†100	8" 5 7/8"	14	10	12075N	12075B	12075P
	*200	10" 8 1/8"	19 1/2	10	12200N	12200B	12200P
 Symmetrical Angle	100	8" 7 3/8"	10 1/2	10	15075N	15075B	15075P
	150	10" 9 1/2"	20	10	15100N	15100B	15100P

†Not RLM Standard when used with 75-watt Lamp.  
Lamps or sockets not included.

\*Not RLM Standard when used with 150-watt Lamp.

## Miscellaneous Fittings

### LOCKING LAMP GUARD

ATTACHABLE TO DOME OR BOWL TYPE REFLECTORS WITH BEAD



Cat. No. 1388  
(Guard only)

Construction—Heavy steel wire guard with welded joints and steel clamp for attaching to bead of reflector. No tools are required for attaching to reflector. Diameter given is that of the reflector which the guard fits.

Finish—Bright tin applied after welding parts. Clamp is electroplated.

Cat. No.	Diameter Inches	Depth Inches	Standard Package	Weight, Lbs. Std. Pkge.
1383	10	2 3/4	10	6
1386	12	3 3/4	10	8 1/2
1388	14	5	10	10
1392	16	4 3/4	10	16
1394	18	6 1/4	10	19
1396	20	4	10	26

### COMPLETE COVER WITH BAND, PLAIN CLEAR GLASS, AND GASKET



Cat. No. Cover Complete	Cat. No. Gasket	Cat. No. Glass	Description
N-6410	6480	6460	For 10" Dia. Reflector
N-6412	6482	6462	For 12" Dia. Reflector
N-6414	6484	6464	For 14" Dia. Reflector
N-6416	6486	6466	For 16" Dia. Reflector
N-6418	6488	6468	For 18" Dia. Reflector
N-6420	6490	6470	For 20" Dia. Reflector



# Miscellaneous Fittings, cont'd

## CAST IRON COVER AND GASKET



Cat. No. 5020

Catalogue No.	Description	Ship. Wgt. Lbs.	Standard Package
5020	Flange and Gasket	13	10
5021	Gasket only	1	10

## 45° BALL FIXTURE ALIGNER

### OUTLET BOX COVER TYPE

Cat. No. 3380 Ball Fixture Aligner, although permitting the fixture to hang plumb and protecting it against mechanical jars and shocks, is comparatively inexpensive, costing little more than an ordinary outlet box cover and fixture stud. It consists of a cast-iron ball, which is mounted between two riveted steel plates. Ball, which is tapped for 1/2-inch iron pipe, has hexagon neck, which affords a convenient means for gripping and holding ball when iron pipe is screwed in. Cover attaches directly to standard 3 1/2-inch or 4-inch outlet boxes by means of two screws.

Finish is sprayed aluminum applied over electroplating.



Cat. No. 3380

Cat. No.	Description	For Box	Size Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
3380	Aligner only, with Steel Cover	Std. 3 1/2" and 4"	1/2"	25	19

## ALIGNER WITH SHOCK ABSORBER

### OUTLET BOX COVER TYPE

Benjamin Aligner and Shock Absorber, No. 3366, has shock-absorbing feature and flexible knuckle, permitting fixture to hang plumb. Mounting screw holes are elongated. Fitting is supported by a steel cover, which fastens to standard 4-inch outlet boxes.

Finish is sprayed aluminum applied over electroplating.

Medium springs are supplied as standard to accommodate fixtures weighing from 3 to 8 pounds. When required for fixtures weighing from 9 to 16 pounds, specify "with heavy spring," which will be supplied without extra cost.



Cat. No. 3366

Cat. No.	Description	For Box	Size Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
3366	Aligner with Steel Cover	Std. 4"	1/2"	10	9

## IRON GOOSENECKS WITHOUT FITTING

Iron parts are finished in sprayed aluminum applied over electroplating.



Cat. No. 5036

Cat. No.	Size	Standard Package	Weight, Lbs. Std. Pkge.
5036	30" x 1/2"	10	23
5037	40" x 3/4"	10	55

## POLE AND WALL FITTINGS

Cat. No. 5025 has curved back to fit pole, and both styles have wire entrance slots for internal wiring. Iron parts are finished in sprayed aluminum applied over electroplating.



Cat. No. 5025



Cat. No. 5026

Cat. No.	Kind of Fitting	Size Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
5025	Pole	1/2"	50	36
5026	Wall	1/2"	50	29

## WALL FITTINGS

Iron parts are finished in sprayed aluminum applied over electroplating.



Cat. No. 5027



Cat. No. 5031

Cat. No.	Description	Size Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
5027	Without Wire Openings	3/4"	10	15
5028	Without Wire Openings	1/2"	10	15
5031	With Insulated Wire Openings	3/4"	10	18
5032	With Insulated Wire Openings	1/2"	10	19 1/2

## INSULATING BUSHING

For use with fixtures tapped 1/2-inch, 1 1/2-inch centre hole where it is desirable to use drop cord suspension.



Cat. No. 1265

Cat. No.	Material	Standard Package	Wgt. Lbs. Std. Pkge.
1265	Composition	100	1 1/2



*Miscellaneous Fittings, cont'd***STRAIN RELIEF CORD GRIP**

Cat. No. 1261

The Benjamin Strain Relief Cord Grip, Cat. No. 1261, is a simple type of fitting which serves both as a strain relief and a cord bushing. It is easily attached to any socket tapped  $\frac{1}{2}$ -inch, and accommodates any cord from  $\frac{3}{8}$ -inch to  $\frac{1}{2}$ -inch diameter, inclusive.

When properly installed, this fitting will relieve the wiring terminals of all strain, transferring it to the body of the socket.

Construction—Consists of an electro-plated malleable-iron bushing, with  $\frac{1}{2}$ -inch iron pipe thread, to which two steel straps, forming the cord grip, are attached by machine screws.

Cat. No.	Description	Standard Package	Wgt. Lbs. Std. Pkge.
1261	Strain Relief Cord Grip	10	1



Cat. No. 6203

**CROSS ARM WITH PORCELAIN WIRE OPENINGS**

Cast and malleable-iron parts are sprayed aluminum over electro-plating.

Cat. No.	Bottom Thread	Top Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
6203	$\frac{3}{4}$ "	$\frac{3}{4}$ "	10	30
6205	$\frac{1}{2}$ "	$\frac{3}{4}$ "	10	29

**CLAMP TYPE CABLE SUSPENSION FITTING WITH CROSS ARM**

This type of Benjamin Cable Suspension Fitting is equipped with a cross arm, having porcelain knobs for supporting current-carrying wires. A hook-type clamp is provided which accommodates  $\frac{3}{16}$ -inch to  $\frac{1}{2}$ -inch diameter messenger cable. Two porcelain bushed wire openings are furnished in the fitting. Iron parts are finished in sprayed aluminum applied over electro-plating.



Cat. No. 6037M

Cat. No.	Type	Size Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
6036	For 2-Wire Service	$\frac{1}{2}$ " (Female)	10	22
6037M	For 2-Wire Service	$\frac{1}{2}$ " (Male)	10	22
6040M	For 3-Wire Service	$\frac{1}{2}$ " (Male)	10	24

**WITHOUT CROSS ARM**

The Benjamin Cable Suspension Fitting without the cross arm is similar in other respects to the above type. Iron parts are finished in sprayed aluminum applied over electro-plating.

Cat. No.	Size Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
6038	$\frac{1}{2}$ " (Female)	10	15
6039M	$\frac{1}{2}$ " (Male)	10	15



Cat. No. 6039M

**SHOCK ABSORBER SUSPENSION FITTING**

Iron parts are sprayed aluminum applied over electro-plating.

Cat. No.	Description	Size Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
6030	Iron, Finished in Sprayed Aluminum Applied over Electro-plating	$\frac{1}{2}$ "	10	11



Cat. No. 6030



Cat. No. 6029



Cat. No. 6028



Cat. No. 6031 M

**SUSPENSION FITTINGS****WITH NON-INSULATED WIRE OPENINGS**

Iron parts are finished in sprayed aluminum applied over electro-plating.

Cat. No.	Size Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
6029	$\frac{1}{2}$ "	10	9 $\frac{1}{2}$
6028	$\frac{1}{2}$ "	10	5 $\frac{1}{2}$

**WITH PORCELAIN WIRE OPENINGS**

Cat. No.	Size Tapped	Standard Package	Wgt. Lbs. Std. Pkge.
6031	$\frac{1}{2}$ " (Female)	10	10 $\frac{1}{2}$
6031M	$\frac{1}{2}$ " (Male)	10	11

# Northern Electric

COMPANY LIMITED

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TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY PORT ARTHUR  
WINNIPEG REGINA CALGARY EDMONTON VERNON VANCOUVER VICTORIA





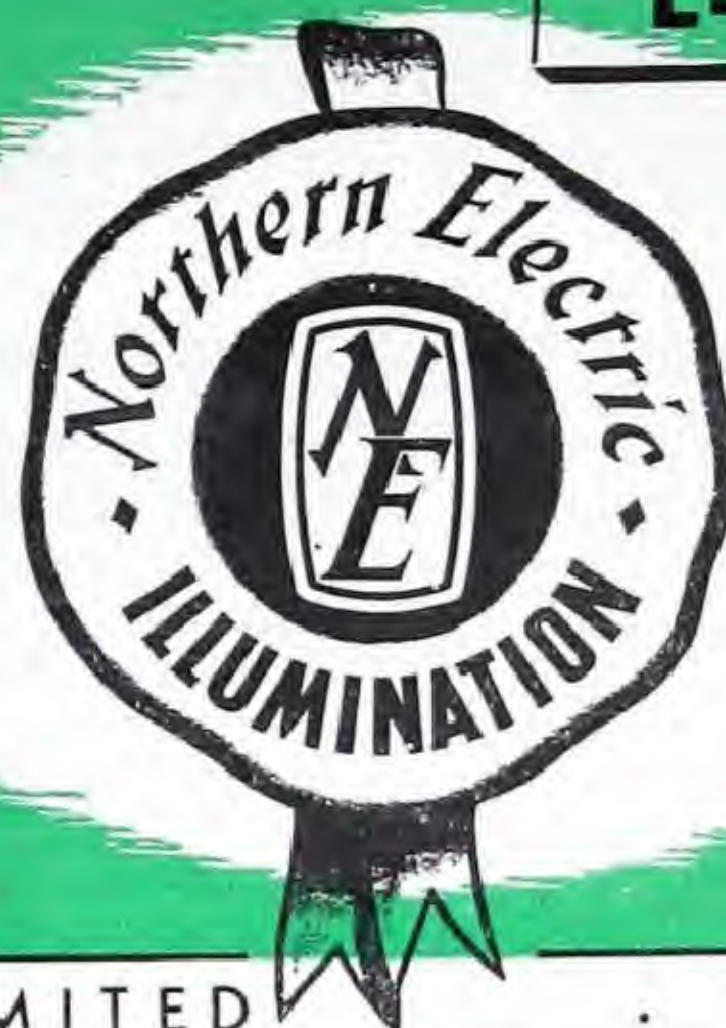


*Nor-Lectric*

October 1943

L-3-2

# BULLETIN



PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1943

## MORE PRODUCTION IN WARTIME

WITH EFFICIENT  
CONTROLLED  
LIGHT FROM

**X-RAY**  
MADE IN CANADA  
**Reflectors**



GOLDEN-

ARMoured  
FOR YOUR  
PROTECTION



YOU CAN GET BETTER LIGHT  
QUICKLY—X-RAY REFLECTORS CAN BE SHIPPED FROM  
STOCK.

EFFICIENTLY—SILVER MIRRORED X-RAY GLASS RE-  
FLECTORS COMBINE HIGH EFFICIENCY  
WITH ACCURATE LIGHT CONTROL.

AND FREELY—X-RAY REFLECTORS USE THE MINIMUM  
OF CRITICAL MATERIALS. NO RESTRIC-  
TIONS.

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COMPANY LIMITED

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REGINA

CALGARY  
EDMONTON  
VERNON  
VANCOUVER  
VICTORIA



## HIGH BAY REFLECTORS... Semi-Concentrating



**X-Ray**  
Reflectors

Made  
in  
Canada

For HIGH INTENSITY lighting from reflectors mounted high above the working plane (over 30 feet), use SEMI-CONCENTRATING units.

For UNIFORM ILLUMINATION, spacing between units should not exceed three-quarters of the mounting height above the working plane. For best results spacing should never exceed 25 feet.



Good seeing conditions are even more important in the factory than in the office. It takes much more light to read sixty-fourths on a steel scale than it does to read a newspaper. And the light must be free from glare and shadow in order to make all production seeing tasks quick and accurate.

### HIGH BAY REFLECTORS

LAMP SIZE, WATTS	CATALOGUE NUMBER	DIMENSIONS		STANDARD PACKAGE	
		DIAMETER	O.A. HEIGHT	No. OF UNITS	WEIGHS
300-500	<b>848</b>	13 1/4"	12"	10	53 lbs.
750-1000 Bipost	<b>592</b>	17"	19 1/4"	2	35 lbs.
750-1000-1500	<b>590</b>	20"	23"	2	42 lbs.

Reflector, Holder and Socket for 1/2" pipe are included in Catalogue Number.

## DISTRIBUTING REFLECTORS... For General Lighting



For HIGH INTENSITY lighting from reflectors mounted at medium or low heights above the working plane (from 10 to 30 feet) use DISTRIBUTING units.

For UNIFORM ILLUMINATION, spacing between units should not exceed one and a half times the mounting height above the working plane.



### DISTRIBUTING REFLECTORS

LAMP SIZE, WATTS	CATALOGUE NUMBER	DIMENSIONS		STANDARD PACKAGE	
		DIAMETER	O.A. HEIGHT	No. OF UNITS	WEIGHS
200-300 Medium Base	<b>575-C</b>	9 3/8"	11"	8	32 lbs.
300-500	<b>588</b>	12"	14 1/4"	4	24 lbs.
750-1000 Bipost	<b>595</b>	17"	19 1/4"	2	35 lbs.
750-1000-1500	<b>589</b>	20"	20"	2	35 lbs.

Reflector, Holder and Socket for 1/2" pipe are included in catalogue number.



## ANGLE TYPE REFLECTORS... For Vertical Surfaces



**X-Ray  
Reflectors**

When you need light on vertical surfaces or on areas the overhead lighting cannot reach, mount these angle type reflectors on columns or side walls.



### ANGLE TYPE REFLECTORS

LAMP SIZE	CATALOGUE NUMBER	DIMENSIONS		
		WIDTH	DEPTH	HEIGHT O.A.
150	<b>400</b>	8½"	8"	11"
200	<b>500</b>	10"	10½"	12½"
300-500	<b>900</b>	13"	13"	13¾"

Catalogue Nos. **400** and **500** include Reflector and Holder only.  
Catalogue No. **900** includes Reflector, Holder and Socket for ½" pipe.

## INTERIOR FLOODLIGHTS... Concentrating Type

For a high intensity of light on a small area such as the face plate of a lathe, milling cutter, punch press or drill press, use an adjustable floodlight. Mount it on the ceiling, sidewall or column where it is out of the way and direct its powerful beam on the work.

### "Center SPOT Beam"

Distribution of light from Nos. 44, 33 or 88 type, showing flood of light and "Center SPOT Beam."



Catalogue No.

Standard Lamp

### On Short Swivel Base:

44	"Pup".....	150-100 watt
33-B	"Lion".....	200 watt
88-B	"Tiger".....	500-300 watt



**X-Ray  
Reflectors**

### EVERY LIGHTING INSTALLATION SHOULD BE ENGINEERED

Northern Electric Branch House Lighting Specialists are available to plan your installation for you. Here is the information we should have to design a proper lighting installation:

- Type of work to be lighted.
- Length, width and height of area to be lighted.
- Colour (light, medium or dark) of ceiling and walls.
- A plan of the area showing bays, aisles and working area.



## CURTIS INDIRECT LUMINAIRES



### USING X-RAY REFLECTORS For Drafting Rooms and Offices

Curtis Luminaires, with concealed X-Ray Reflectors, produce a high intensity of glareless light that is evenly distributed throughout the room. With no bright spots and almost shadowless lighting, Curtis Luminaires provide the type of illumination that is easy on the eyes and this insures fast, accurate, comfortable work.

"THE WINNER"—No. 5090 Catalogue

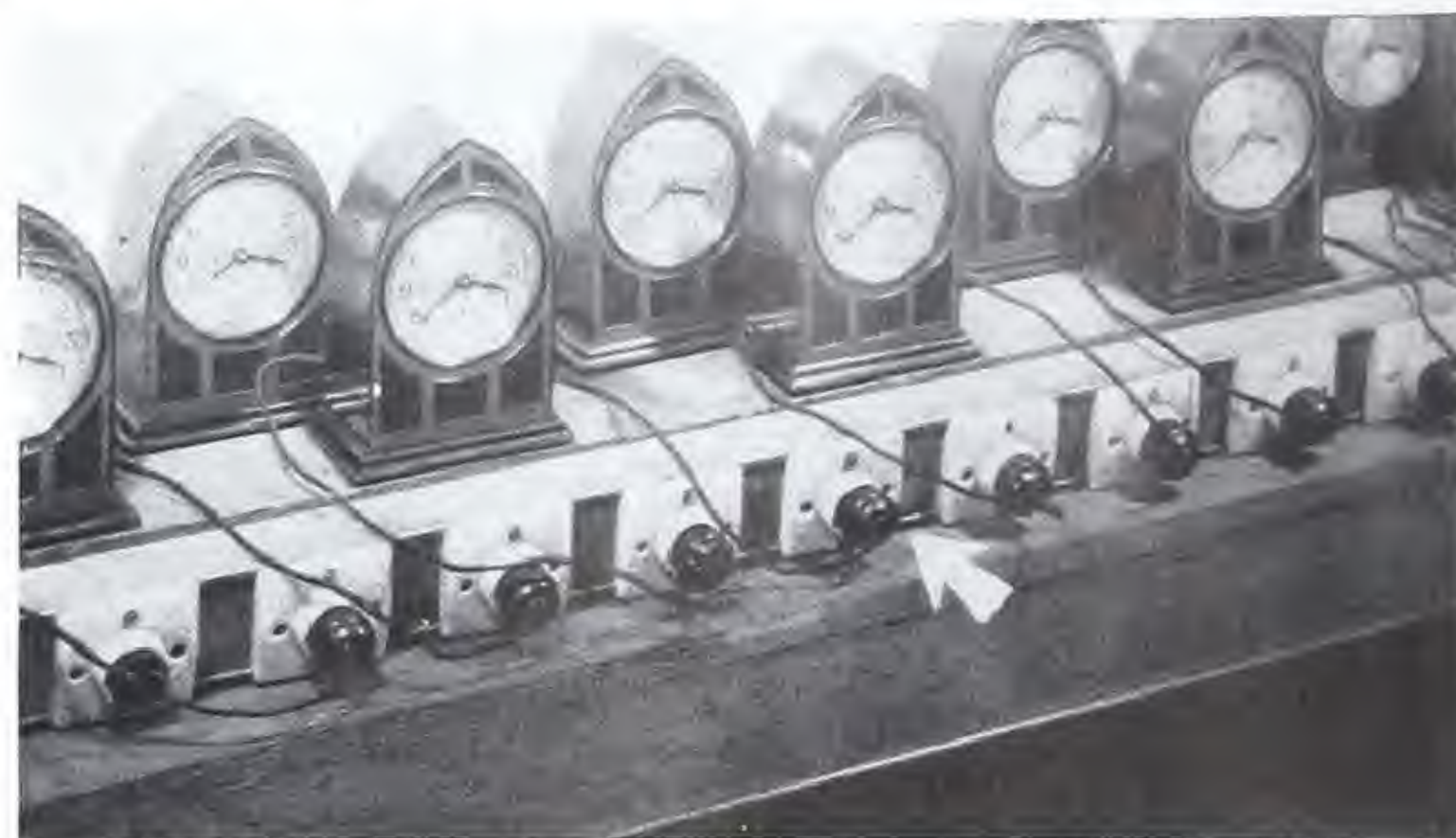
This is a totally indirect luminaire embodying simplicity and trimness in style with maximum lighting efficiency. Recommended for those interiors where close eye-work is performed—offices, schools, drafting rooms.

500- or 300-watt: Bowl diameter 19½", depth 7", suspension 36".

## CURTISTRIP... For Flexible, Simplified Wiring

CurtiStrip is a large capacity (30 No. 14 R.C. Wires) wiring channel and raceway that offers unusual flexibility and a wide range of uses with its standardized fittings. The patented snap-in flat cover permits outlets to be installed on any spacing. The cover, placed between sockets or fittings, is cut to length required with tinner's shears and snaps into the lips of the channel. Channel may be cut to any length with a hacksaw. Sections longer than 10 feet may be coupled together to form a continuous channel.

CURTISTRIP ASSEMBLED



CurtiStrip is convenient for plugging in electrical equipment for testing purposes. Installed over or on work benches, the No. 4 plug-in receptacle is used for connecting electric glue pots, soldering irons and all types of electrical tools.

**Northern**  
COMPANY



**Electric**  
LIMITED

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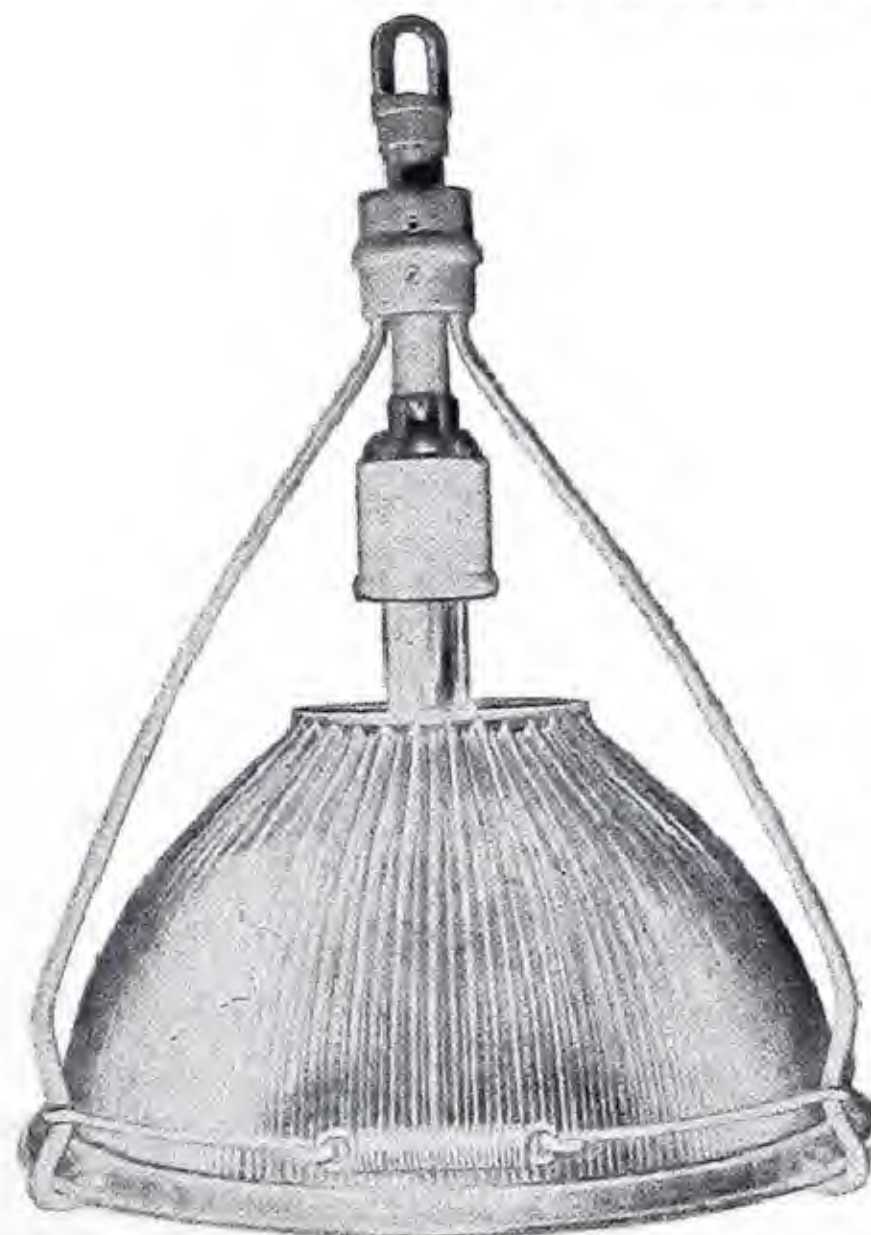
BULLETIN

## Maybe It's Your Lighting!

With today's demand for high speed precision work at its height, the need arises in many shops for efficient up-to-date equipment — equipment which can be installed with the minimum of rewiring and which assures the maximum of illumination.

The Holophane lighting equipment shown in this bulletin is recommended because —

1. Holophane efficiency is extremely high, making possible a great improvement in your light with the minimum of rewiring.
2. Holophane accurate control of light permits use of the minimum number of units.
3. Holophane smooth glass inner surface permits easy and complete cleaning; since glass is chemically inert, the reflectors suffer no permanent depreciation.
4. Holophane adaptability to a wide variety of socket and holder construction makes its application practical and economical.



Where lighting units are mounted at great heights — such as are found in heavy industry, turbine rooms, etc. — the use of intensive and concentrating light distribution is a necessity; otherwise, a large portion of the light will be wasted on the upper side walls or intercepted by the mass of machinery itself.

The Holophane Hibay Unit was designed specifically for this application — both from the standpoint of the illumination results and the mechanical ruggedness required.

Cat. No.	Lamp Wattage	Distribution	Space Units on Centers Not Exceeding . . . Times the Mounting Height	Dimen.—Inches	
				Diam.	Depth
690	750-1000	Concentrating	0.6	22	26 <sup>5</sup> / <sub>8</sub>
691	750-1000	Intensive	1.0	19 <sup>3</sup> / <sub>4</sub>	27
692	750-1000	Extensive	1.75	19 <sup>3</sup> / <sub>4</sub>	27 <sup>3</sup> / <sub>8</sub>

These units suitable for 1500 watt lamp size when equipped with locked-on aluminum cover.





No. 682-B, 685-B, 686-B,  
682, 685, 686, 684

Holophane Lobay units feature the choice of three reflectors with focusing, intensive and extensive distributions. The fittings are identical and the reflectors may be interchanged, or covers added, at any time without the necessity of dismantling the electrical connections. The reflector is supported at the bottom in a holding ring and clamped up against the socket holder by means of three threaded rods and nuts.

No. 684 being smaller than the 682, 685 and 686 line, is not interchangeable with them.

No. 685-B, 686-B and 682-B "LOBAY" reflectors give effective, excellent service. Prismatic control of light promotes economy because light is directed to the utility areas where it is needed. A 30° shielding angle effectively eliminates glare.

The prismatic glass reflecting surface is absolutely permanent; it will not suffer permanent depreciation even under the most severe operating conditions. The tripod support holds the reflector in position safely and securely. A simple hinge action allows easy removal of the reflector for cleaning. Open socket construction permits free ventilation; this reduced socket heat for the 750 watt Bi-Post lamp obviates costly socket trouble. Three reflectors for use with 750 watt Bi-Post lamps (6585, Intensive distribution; 6586, Focusing distribution; 6582, Extensive distribution) are all easily interchangeable in the same fixtures.

No. 685-B is especially recommended for low bay locations where mounting heights are greater or where extra high footcandle values are desired.

No. 686-B is designed for higher-than-average low bay mounting heights and where a concentrated light is necessary for detail work.

No. 682-B is recommended for use in low bay locations where a widespread, even light distribution is desired.



No. 606, 615

## One-Point-Five Lobay Reflectors

For all kinds of industrial and commercial utility applications.

These low cost units are designed to provide adequate, even illumination on spacings as great as 1.5 times the mounting height above the work. Unit is designed with a shielding angle of 25° to effectively eliminate glare. Economical to install and operate. Two sizes are avail-

able to accommodate lamps ranging from 25 to 150 watts.

The prismatic glass reflecting surface is impervious to depreciation even under the toughest operating conditions. Fixture parts are of steel. Reflectors are of heavy pressed prismatic glass with reinforcing flange at bottom edge.



No. 606-BC, 615-BC

## Small Reflectors For Bracket Suspension



No. B-606, B-615

Holophane reflectors Nos. B-606 and B-615 are general utility reflectors where the job calls for isolated units to be mounted on brackets. These units have an extensive light distribution and are for use with lamps ranging from 25 to 150 watts. Their smooth inside reflector surface is easily restored to original efficiency by using ordinary soap and water or washing compound.

The Holophane Cranelight is an efficient, rugged lighting unit which will withstand the whip and vibration produced by the crane movements and at the same time provide a concentrating distribution.

Three compound double action steel springs absorb shock up and down as well as sideways. These springs are adjustable to tension. The Cranelight is fastened to the crane by a 10 1/4 inch diameter, 1/2 inch thick plate. Wide flange construction assures solid contact with the crane. A 3/4 inch female pipe thread is provided to the socket for wiring.

The Cranelight when installed under the catwalk is relamped by raising a section of the catwalk. When mounted on the edge of the catwalk it is swung up for relamping by using an angle section attached to the catwalk.

## Cranelight



No. 694

## 400 Watt Mercury Lamp

Industrial Specific for use with the 400 watt Mercury Vapor Lamp. This unit is logically applied where higher light intensities are required and where the available wattage is limited. Especially recommended for lighting in the metal and aircraft industries. No other reflector made for the 400 watt Mercury Lamp will deliver as many footcandles under comparable conditions.

A 30° shielding angle plus the deep reflector construction which keeps the elongated Mercury Lamp high in the reflector, eliminates glare at all normal working angles of view. The prismatic glass reflecting surface is absolutely permanent; it suffers no permanent depreciation. The non-corrosive fixture parts are practically impervious to deterioration. A tripod support holds the reflector in position safely and securely. A simple hinge action allows easy removal of the reflector for cleaning and for attaching the removable cover. An open husk construction permits free ventilation

to cut down costly socket replacement.

The fitter is made of cast metal with ventilating openings, terminating in 1/2" female pipe thread and supporting the reflector from three steel rods and bottom steel supporting ring. For ordinary conditions of general illumination, these units will produce approximately 20 footcandles per watt per square foot of floor area.



No. 645



Cat. No.	Lamp Wattage	Distribution	Space Units on Centers Not Exceeding . . . Times Mtg. Height	Dimensions—Inches		Termination	Maximum Spacing
				Diam.	Depth		
606	25-40-60		1.5	7	6 <sup>3</sup> / <sub>8</sub>	Tapped for 1/2" Pipe	
615	100°-150			10	10		
620	200-300 Medium Base			12	11 <sup>1</sup> / <sub>4</sub>		
606-BC	25-40-60		1.5	7	5 <sup>5</sup> / <sub>8</sub>	3 1/4" or 4" Box Cover	
615-BC	100°-150			10	9 <sup>1</sup> / <sub>4</sub>		
620-BC	200-300 Medium Base			12	10 <sup>1</sup> / <sub>2</sub>		
B-606	25-40-60		1.5	7	7 to stem	3/8" Female Hickey for attachment to box stud	
B-615	100°-150		1.5	10	10 1/2 to stem		

\*Use 7/8" socket extension for 100 watt lamp with above units.

645	400 Watt Mercury	Intensive	1.25	13 <sup>13</sup> / <sub>16</sub>	15 <sup>5</sup> / <sub>8</sub>	All Tapped for 1/2" Pipe	
684	200-300†	Intensive	1.5	11 <sup>7</sup> / <sub>8</sub>	11 <sup>1</sup> / <sub>2</sub>		
682	300*-500	Extensive	2.0	13 <sup>13</sup> / <sub>16</sub>	12 <sup>3</sup> / <sub>8</sub>		
685	300*-500	Intensive	1.5	13 <sup>13</sup> / <sub>16</sub>	12 <sup>3</sup> / <sub>8</sub>		
686	300*-500	Concentrating	0.75	13 <sup>13</sup> / <sub>16</sub>	12 <sup>3</sup> / <sub>8</sub>		
682-B	750 Watt Bi-Post	Extensive	2.0	13 <sup>13</sup> / <sub>16</sub>	12 <sup>3</sup> / <sub>8</sub>	All Tapped for 1/2" Pipe	20' Centers
685-B		Intensive	1.5				
686-B		Concentrating	0.75				
694		Concentrating		22 <sup>5</sup> / <sub>8</sub>	21		

\*Mogul base lamp. †300 watt 6" light center medium base lamp. ‡Socket for 750 and 1000 watt bi-post at extra cost.

## Stock Bins and Storage Areas



No. H-2076-S

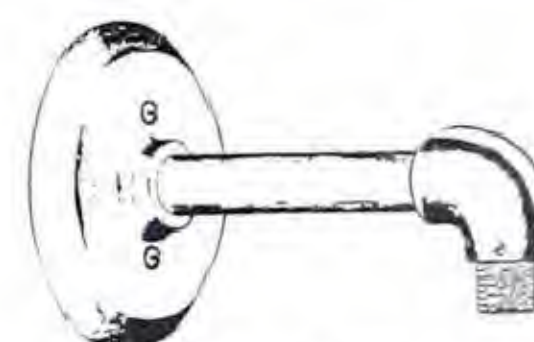
Narrow aisle conditions are best treated with units having an asymmetric distribution (more light in some directions than in others). To mention just two of these:

1. Odd shaped areas such as aisles or corridors.
2. Reading or other work operations on vertical or sloping surfaces.

No. H-2076-S is of excellent service as it provides uniform illumination on shelves from top to bottom and from unit to unit when spaced as recommended herein.

Space this unit on centers not exceeding 1.0 times the mounting height.

The application of the Nos. 830 and 832 units is somewhat different. With their lower wattage, they are logically installed where the area to be lighted is limited. For example, they are used over doorways, in small parking areas, around automobile service stations, etc. Many thousands of these units are being used indoors for the lighting of large warehouses and storage areas. These units are tapped for 1/2" pipe thread. Mechanically they have all the bug-tight and weather-proof characteristics of the larger units. Bracket No. 0918 is available for these units.



No. 0918

Cat. No.	Lamp Wattage	Distribution	Space Units on Centers Not Exceeding . . . Times Mtg. Height	Dimen.-Inches		Termination
				Diam.	Depth	
830	100†-150	Symmetric	6	8	10 <sup>5</sup> / <sub>8</sub>	Tapped for 1/2" Pipe
832	200	Widespread	6	9	12	
H-2076-S	100†-150	Assymetric	1.0	8 <sup>3</sup> / <sub>4</sub>	10 <sup>3</sup> / <sub>8</sub>	

†Use 7/8" socket extension with 100 watt lamp.

**No. 0918 Bracket**—This is a close fitting outdoor type bracket with a span of 6". It terminates at the wall end in a canopy to cover a 3 1/4" box. The fixture end has a standard 1/2" pipe thread.



No. 830, 832

## Vapor-tight - Dust-tight



No. 02328

Moisture areas—acid plants, artificial leather factories, boat building plants, breweries, distilleries, warehouses, dye, paint and varnish plants, textile dyeing, finishing and bleaching, synthetic rubber and other chemical plants.

Holophane units deliver more useful light than any other system.

Common practice is to install vaportight lighting equipment which meets the vapor-tight requirements but offers little in light control, the unit being essentially a bare lamp surrounded by a clear glass globe. Holophane vaportight specifics bring to industry the protection required with the added advantage of a variety of light patterns allowing the proper light distribution for the particular work. This makes for efficient and economical lighting; the major portion of the light is directed to the work and less units are required than with ordinary lighting units. Also the wide range in wattage sizes permits economical realization of the illumination level desired.

Mechanically, the units have been carefully designed to insure full compliance with the Underwriters' requirements for this type of equipment. The cast metal threaded fitters are accurately machined, have heavy durable gasket and insure a vaportight fit.

The upper part of the globe reflects the light to the lower member which diffuses and distributes it effectively over the work area. Wherever possible, smooth surfaces are utilized. This simplifies cleaning which restores the unit to its original light controlling efficiency. There is absolutely no permanent depreciation of the prismatic light controlling element.



No. 02338



No. 02368, 02378

Cat. No.	Lamp Wattage	Space Units on Centers Not Exceeding . . . Times Mounting Height	Dimensions—Inches	
			Diameter	Depth
02328	100†-150	2.25	8 <sup>5</sup> / <sub>8</sub>	10 <sup>3</sup> / <sub>4</sub>
02368	100†-150	2.0	10 <sup>1</sup> / <sub>2</sub>	11 <sup>1</sup> / <sub>2</sub>
02378	200	2.0	12	12 <sup>7</sup> / <sub>8</sub>
02338	200	1.0	10 <sup>1</sup> / <sub>2</sub>	12 <sup>3</sup> / <sub>8</sub>

†Use 7/8" socket extension with 100 watt lamp.





No. 04333, 04179,  
04377, 04338

## Wide-spread Symmetric or Asymmetric

Holophane Refractors collect the light from the bare lamp and spread it out at wide angles. This equalizes the pattern of light by reducing it under the unit, and building it up in between units.

Where light is to be spread equally in all directions (symmetrical distribution), Holophane provides a range of units designed for wattage as low as 100 and up to 500 watt lamps. With the smaller units (100, 150,

200 watt lamps) an overlap of light can be obtained with a spacing six times the mounting height. With the larger units (300 and 500 watt lamps) spacings as great as twelve times the mounting height can be used.

Some locations are more effectively lighted with units having asymmetric distribution (more light in some directions than others). For example, long passageways between buildings are best lighted by refractors having a fan-shaped distribution. With these units mounted on brackets on building sides the light pattern may be dove-tailed and an even coverage of light laid down through the passageways. The light is so controlled that only a very small part escapes back against the wall; the greater portion is spread out and downward in the useful directions.

Cat. No.	Lamp Wattage	Distribution	Dimensions—Inches		Termination
			Diameter	Depth	
04338	300*	{ Symmetric Widespread }	12 $\frac{7}{8}$	13 $\frac{1}{4}$	All Tapped for 1 $\frac{1}{2}$ " Pipe
04333	500		16 $\frac{1}{4}$	16 $\frac{1}{4}$	
04377	300*	{ Asymmetric Widespread }	12 $\frac{7}{8}$	13 $\frac{1}{4}$	
04179	500		16 $\frac{1}{4}$	17 $\frac{3}{8}$	

\*Medium base 6" light center lamp.

## Outdoor Sub-station



No. 043386, 043776

The safe and efficient operation of an outdoor sub-station requires that the disconnect switches and other important apparatus be well lighted. Since the critical parts are located high in the structure, the lighting units should be located below and to one side so as to illuminate that face of the apparatus which can be seen from the ground. To avoid the possibility of glare, the units are commonly mounted above the eye level and direct their rays upward.

The Holophane sub-station unit is ideally suited for this application. Its upward spread of light is sufficiently broad so that units can be arranged to supplement each other. This is important since the light from the unit nearest to a switch is often blocked by the intricate constructional details of the structure itself.

By loosening a lock nut, the entire unit may be rotated about its axis while burning, and the angle of maximum candlepower raised or lowered to coincide with the disconnect switches or other important apparatus.



No. 0871

Cat. No.	Lamp Wattage	Distribution	Spacing	Dimensions—Inches		Termination
				Diameter	Depth	
043386	300-500	Inverted Widespread Symmetric	Special	14 $\frac{3}{4}$	19 $\frac{1}{4}$ Min. 19 $\frac{3}{4}$ Max.	Tapped for 1 $\frac{1}{2}$ " Pipe
043776	300-500	Inverted Widespread Asymmetric	Special	14 $\frac{3}{4}$	19 $\frac{1}{4}$ Min. 19 $\frac{1}{2}$ Max.	

**No. 0871 Bracket**—A very strong bracket of 21" span made of cast aluminum. Terminates at wall with 4" diameter box having four flanged supports drilled to pass  $\frac{3}{8}$ " bolts. Box tapped one side  $\frac{3}{4}$ " female pipe thread.

## Recessed or Surface Mounting Asymmetric Refractolens

There has always existed a demand for an outdoor lighting unit which could be: (1) recessed in a wall or placed flat against it, (2) would spread the light outward at a wide angle in a fan-shaped pattern. The uses for such a unit include parking yards, entrances, shipping platforms, underpasses—where looks, performance and serviceability are important.

U-818 has a round cast aluminum housing which may be mounted against a wall or recessed to a depth of 3 $\frac{1}{2}$  inches. A cast door on the outer face carries a curved Refractolens consisting of an inner and outer prismatic lens, nested together. Three captive bolts hold the door tightly against the gaskets of the housing and make the unit weather-proof and bug-tight.

Cat. No.	Lamp Wattage	Ratio—Spacing to Mounting Height	Dimen.—Inches		Termination	Net Wt. Each Lb.
			Diam.	Depth		
U-818	200	4	16	6 $\frac{3}{4}$	Threaded for 1" pipe on top and back	21



No. U-818

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 *Nor-Lectric*

L-3-3

# BULLETIN



PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED • 1943

## *Maybe It's Your Lighting!*

In building Canada's large new war industries, ample lighting has been provided. But where contracts and sub-contracts go to the older and smaller shops, troubles develop in trying to do today's high-speed, high-precision work with yesterday's equipment built to yesterday's standards.



Inside this bulletin are shown some of the lighting devices that lend themselves to RELIGHTING THE SMALLER SHOPS.

These items, made of Holophane Prismatic Glass, are recommended because:—

1. The priority situation is easier. They contain very little critical material.
2. Their efficiency is extremely high, making possible a great improvement in your light with the minimum of rewiring.
3. Their accurate control of light permits use of the minimum number of units.
4. Their smooth glass inner surface permits easy and complete cleaning; since glass is chemically inert, the reflectors suffer no permanent depreciation.
5. Their adaptability to a wide variety of socket and holder construction makes their application practical and economical.

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## HIGH-BAY MACHINE SHOPS

From a ceiling as high as 100' an adequate working light is driven down to the floor by these Prismatic reflectors.

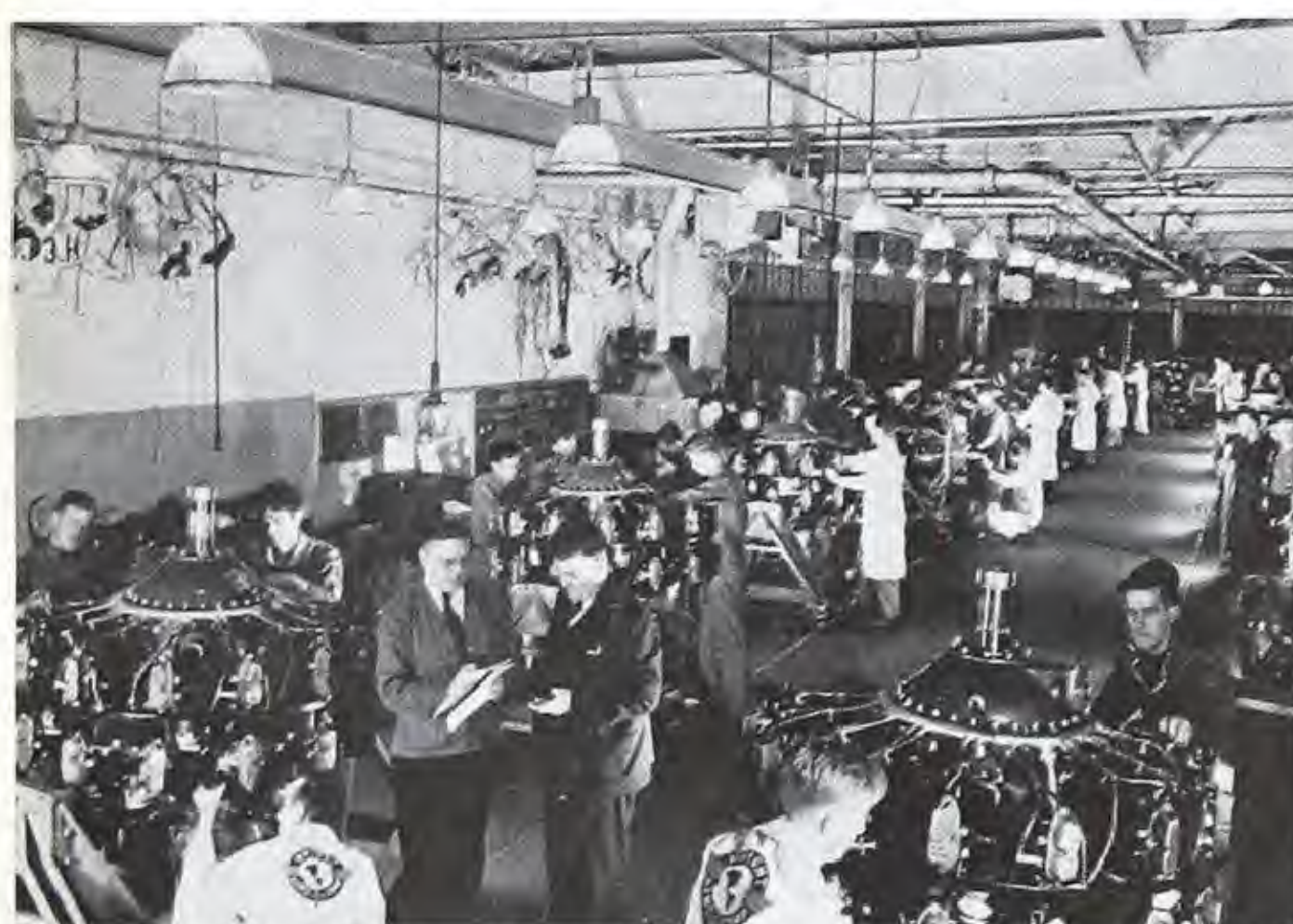
Holophane **990 SERIES** Prismatic Glass Light Director with 1000-watt lamp is standard equipment for such machine shops and for Central Station Generator Rooms.

750-1000 WATT UNITS		
Code No.	Type	Spacing Not to Exceed
<b>990</b>	Concentrating	.6 Mounting Height
<b>991</b>	Intensive (Med.)	1.0 Mounting Height
<b>992</b>	Extensive	1.75 Mounting Height



No. 990, 991 and 992

## LOW-BAY MACHINE SHOPS



Assembling superspeed airplane engines involves close attention. The higher the visibility established, the less the wear and tear on the workers, with fewer man-hours necessary for a given task. Holophane Low-Bay reflectors, **685 SERIES**, are used in the shop shown to give high level illumination.

For smaller areas or local lighting, CSI and CSE type units are used with smaller lamps. These units may be used with self-contained sockets or applied on existing shade-holders.



No. 682, 684, 685 and 686



H-CSI and H-CSE Series

100-150-WATT UNITS			200-WATT UNITS			300-500-WATT UNITS		
Code No.	Type	Spacing Not to Exceed	Code No.	Type	Spacing Not to Exceed	Code No.	Type	Spacing Not to Exceed
<b>HCSI-100</b>	Intensive (Med.)	1.50 Mounting Height	<b>684</b>	Intensive (Med.)	1.50 Mounting Height	<b>686</b>	Concentrating	.75 Mounting Height
<b>HCSE-100</b>	Extensive	2.0 Mounting Height	<b>HCSI-200</b>	Intensive (Med.)	1.50 Mounting Height	<b>685</b>	Intensive (Med.)	1.50 Mounting Height
(Use 3/8" socket extension for use with 100-Watt Lamps)			<b>HCSE-200</b>	Extensive	2.0 Mounting Height	<b>682</b>	Extensive	2.0 Mounting Height

NOTE: For mounting on existing shade holders order: CSI instead of H-CSI; CSE instead of H-CSE.

### *How Holophane Lighting is Selected*

Because Holophane lighting is specialized, a selection must be made among similar units for each job. Northern Electric Lighting Men from coast to

coast can assist you to use this tool to improve plant operation. Write or phone giving us details of your problem and we will be glad to submit our suggestions.





No. H-2076-S



No. 832

## STOCK BINS and STORAGE AREAS

Stock Bins with their high shelves and narrow aisles require special treatment in lighting. Use Holophane **H-2076-S UNITS** with 150-w. frosted lamps spaced not greater than the mounting height.

Note: This unit must be on rigid conduit to prevent rotation.

Where material is piled in varying heights and quantities, the best solution to the lighting problem is to install **No. 832 UNITS** with 200-w. clear lamps, one per bay (20' x 20').



No. S-5630 and S-5640

## DRAFTING OFFICES

Designers and draughtsmen are helped in their daily work by high quality lighting.

Prismatic action of the luminous outer skirts of these units bends the light out at wide angles over the ceiling without defined "cut-off" or harsh shadows. Lighting of this type stimulates high quality work with the minimum of fatigue.

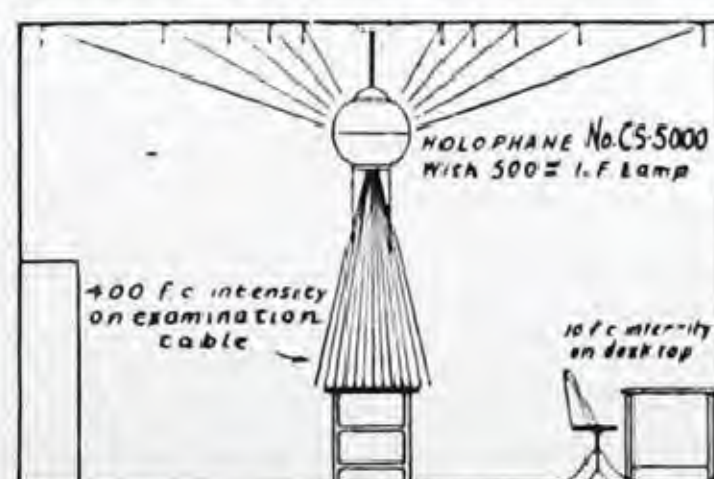
The **S-5630** uses 300-watt Silver Bowl lamp, **S-5640**—500 watt. 300-watt lamps in the area shown produce 40 foot-candles.



## INDUSTRIAL MEDICAL EXAMINATION ROOMS

The Holophane **CS-5000** Medical Examination Unit shown on the left is used in Training Centres and Hospitals of our Armed Forces.

The First Aid Room on the right has general lighting of ten footcandles — with local lighting on the table, 400 foot-candles.



No. CS-5000







## OUTDOOR YARDS and FENCES

The unique advantage of Holophane refractors—particularly for fence lighting—make them especially effective in guarding against sabotage, espionage and theft. Also for outdoor assembly work at night.

The unit shown at the right is available in three light distributions.

**2-way** (narrow beams in two opposite directions).

**B-way** (a roughly semi-circular distribution almost all light being directed to one side of unit).

**Symmetrical** (light distributed slightly below the horizontal plane in all directions).



04338

500 WATT UNITS			200 OR 300 WATT MEDIUM BASE UNITS		
Code No.	Beam	Uses	Code No.	Beam	Uses
04179	B-way	Lighting large areas from side	04376	2-way	Fence lighting
04333	Symmetrical	Important corners or points	04377	B-way	For side lighting
			04338	Symmetrical	For covering wide areas

## SMALL YARDS and INDOOR PROTECTION

For lighting small yards and for indoor protective lighting as a part of the Watchman Service, the Holophane Wide Spread Units **No. 832**

(200 watts) are recommended. These units spread illumination over an area six times their height from the floor.



No. 832

*For other HOLOPHANE items  
see Holophane Datalogue No. C-371-J, distributed by  
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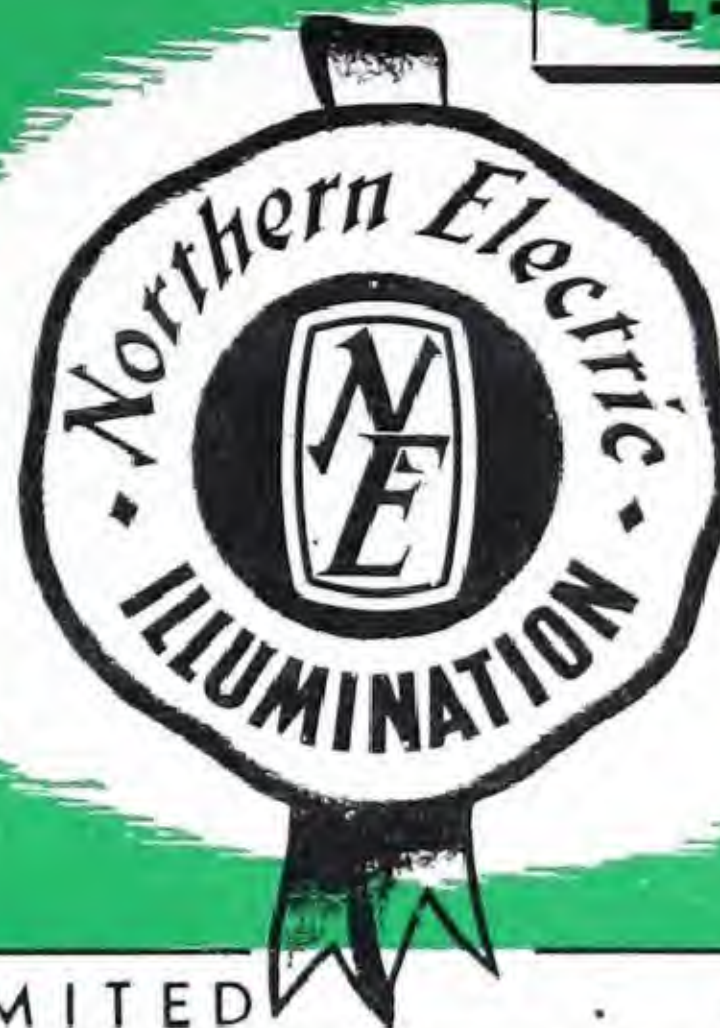


*Nor-Lectric*

April 1944

L-3-5

# BULLETIN



PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

## **Crouse-Hinds Lighting Units** FOR **HAZARDOUS LOCATIONS**



**Explosion-Proof**



**Vapor-Tight**



**Dust-Tight**

Lighting Equipment which safeguards against the danger of fire, explosion, accident and loss of life.

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## Lighting for Hazardous Locations

During recent years, the need for better and safer types of electrical installations in the hazardous industries has been asserting itself very forcibly. Electrical apparatus which is considered safe for ordinary applications has shown itself very unfit for installation in locations where flammable gases, vapours, dusts, and other easily ignitable flammable materials are present.

Conditions have been considerably aggravated also by an increasing use of materials known to be hazardous. New materials and methods have been found for the application of finishes to automobiles, furniture and other manufactured articles; but, unfortunately, many of the materials as well as the methods used for their application introduce unusually severe hazards.

Gasoline and other petroleum products of a highly flammable nature have found wide use in industry and commerce. Pyroxylin and compounds of which it is a part have come to be used for many purposes.

Industries producing flammable dusts have become more numerous and greater in extent. The chemical industry has learned the secrets of producing many substitutes for natural commodities by synthetic means, after entailing the use of hazardous materials and processes.

Such increased production and use of hazardous materials has been attended by numerous fires and

explosions and, in many instances, electric arcs or sparks have been the igniting medium.

Whether or not a given area requires explosion-proof lighting equipment is determined on the basis of safety requirements. It is designed and manufactured to very rigid specifications and is more costly than other types of lighting equipment. This expense must be balanced against increased safety.

As a limiting basis, however, the Canadian Engineering Standards Association in Canada and the Underwriters Laboratories in the United States have established codes establishing certain locations where explosion-proof equipment **must** be used.

The code is the basic minimum but safety considerations will frequently make the use of explosion-proof lighting advisable in locations where, according to the code, it is not mandatory.

Hazardous locations are classified as shown in Section 85, page 3 of the attached pages.

In the attached pages, published in the U.S.A., where the phrase "National Electrical Code" occurs, substitute "Canadian Electrical Code" and, where reference is made to "Underwriters Laboratories," the Canadian reference would be "Canadian Engineering Standards Association," C.E.S.A.

Lighting installations for Class I Groups A and B require special engineering and equipment. Information will be supplied on request.

If you have a problem in lighting a hazardous area, we shall be glad to assist you.

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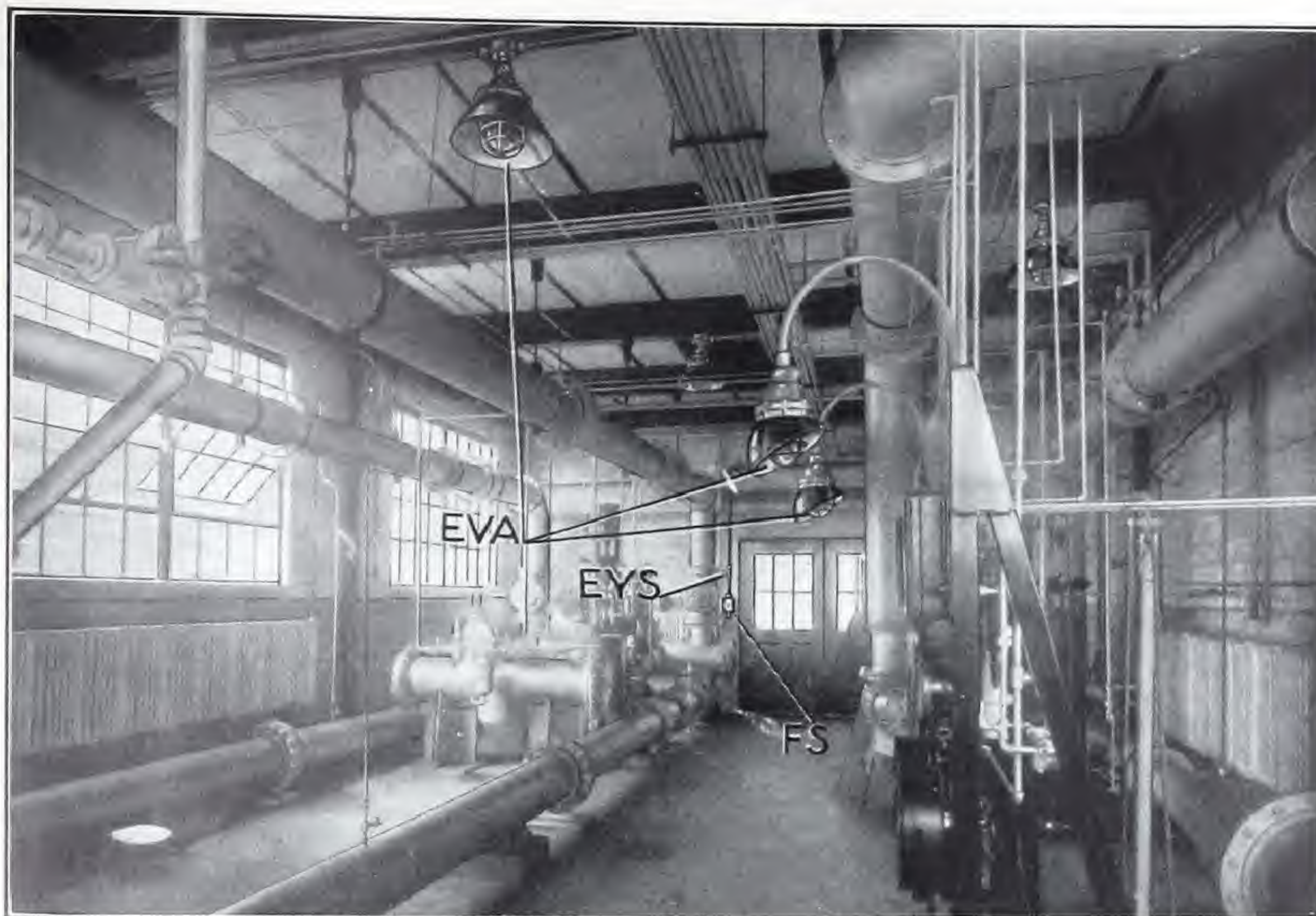
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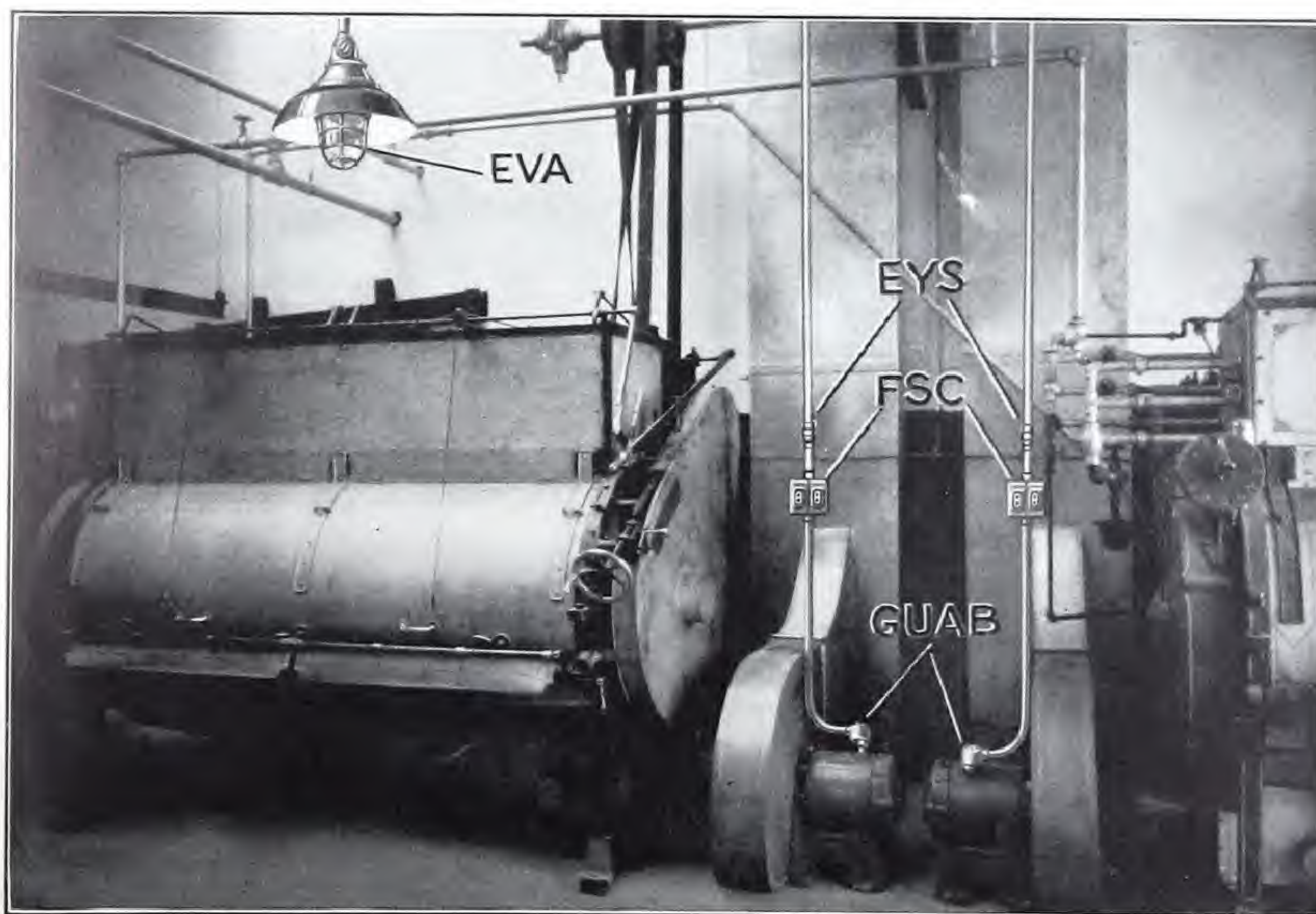
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CROUSE-HINDS



Installation—Explosion-Proof and Dust-Tight Condulets in Gas Plant



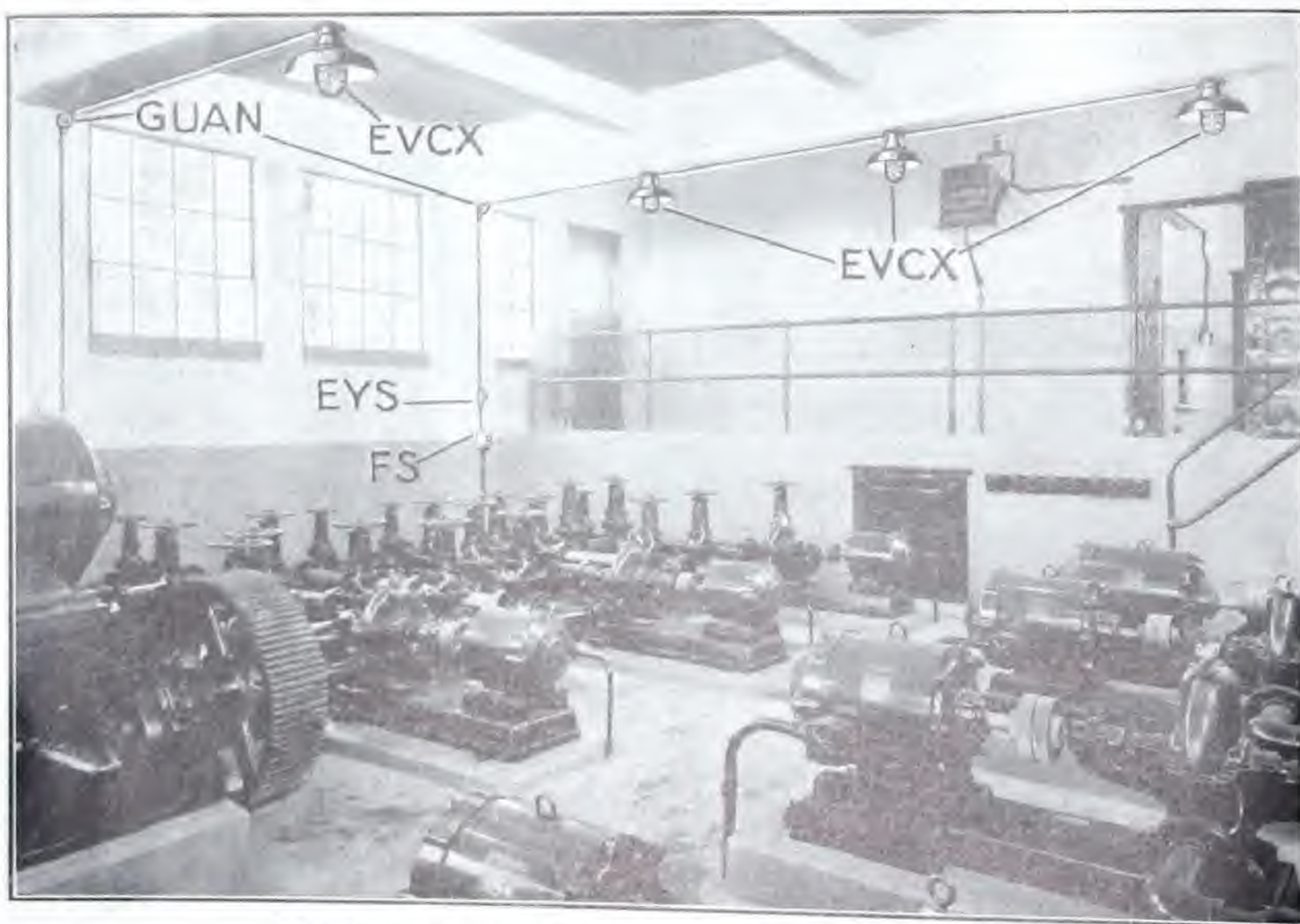
Installation—Explosion-Proof and Dust-Tight Condulets in Dry Cleaning Plant



## CROUSE-HINDS



Installation—Explosion-Proof Condulets and Floodlights—Furniture Spray Booth and Drying Room Area



Installation—Explosion-Proof and Dust-Tight Condulets in Pump House



CROUSE-HINDS

## Condulets for Hazardous Locations

Hazardous locations are classified by Underwriters' Laboratories as follows:

- Class I, Group A—Atmospheres containing acetylene.
- Class I, Group B—Atmospheres containing hydrogen, or gases or vapors of equivalent hazard, such as manufactured gas.
- Class I, Group C—Atmospheres containing ethyl ether vapor.
- Class I, Group D—Atmospheres containing gasoline, naphtha, petroleum, benzol, alcohols, acetone, lacquer solvent vapors, and natural gas.
- Class II, Group E—Atmospheres containing metal dust.
- Class II, Group F—Atmospheres containing carbon black, coal, or coke dust.
- Class II, Group G—Atmospheres containing grain dust.

The articles listed in this section are carefully designed to comply with the exacting requirements of Underwriters' Laboratories for Class I, Groups C and D; and for Class II, Groups E, F, and G locations. Articles for Class I are described as "Explosion-Proof"; those for Class II are described as "Dust-Tight". Reference should be made to Underwriters' Laboratories List of Inspected Electrical Appliances for the particular groups. Due consideration has been given to the metals used to resist corrosion, especially from hydrogen sulphide so generally present in oil refining nitro-cellulose, and other chemical industries.

The National Fire Protection Association some time ago conducted an investigation and study directed toward reducing the danger of fire, explosion, accident, and loss of life, in hazardous industries.

This investigation has resulted in new rules and requirements which owners can use with assurance that their property and personnel have been safeguarded in the best known manner. These rules are being applied to hazardous conditions due to new materials and processes, as well as to old conditions, the hazards of which had not been fully appreciated.

The new rules applying to electrical equipment for hazardous locations may be found in Article 32 of the National Electrical Code and in the requirements of Underwriters' Laboratories for equipment for use in such locations.

Among the new materials and processes can be included the manufacture and use of pyroxylin plastics and lacquers, modern oil refining methods, sewage reduction processes, and other similar products and processes.

In the older group may be included gas plants, oil refineries, gas and oil wells, pumping, handling, and storage equipment; also the manufacture and use of paints, varnishes, explosives, celluloid, photographic films, and other nitro cellulose products, and the storage, handling, and transportation of these products.

Pyroxylin plastics, lacquers, and lacquer solvents are now generally regarded by users as highly flammable and are handled with certain precautions, but few know to what extent safeguarding should be carried. For instance, the following is not generally appreciated:

	FLAMMABLE LIMITS	
	LOWER	UPPER
Gasoline Vapor . . . . .	1.4%	6%
Ethyl Ether Vapor . . . . .	1.9%	22%
Ethylene . . . . .	3.3%	25%
Methyl Chloride . . . . .	8.1%	17.2%
Illuminating Gas . . . . .	7.0%	21%

In other words, the air of a room which is contaminated by vapors of the above materials between the limits given is a flammable mixture and if ignited will explode.

Electricity, with proper safeguards, can be used in hazardous locations with a greater degree of safety than any other form of energy for power, lighting, or heating. It is the purpose of this brief discussion to describe some of the methods used in safeguarding electrical equipment.

Explosions from electrical ignition usually can be charged to:

- (1)—Normal arcs occurring during operation of switches, circuit breakers, etc.;
- (2)—Abnormal conditions due to
  - a—Insulation failure,
  - b—Faulty connections,
  - c—Overheating (conductors, apparatus, or equipment), or
  - d—Static discharges.



CROUSE-HINDS

## Condulets for Hazardous Locations

### SEQUENCE OF STEPS IN A GAS OR DUST EXPLOSION

- (1)—A flammable mixture of gas, vapor, or dust with air is ignited by an arc, spark, hot wire, or overheated apparatus or equipment;
- (2)—The flame spreads rapidly in all directions;
- (3)—The flame results in heat;
- (4)—The heat expands the gases; and
- (5)—Causes an explosive rise in pressure within an enclosure.
- (6)—If the enclosure is large enough or of the proper shape, unignited gas ahead of the rapidly spreading flame may be pre-compressed to such an extent that it will detonate with extremely high pressures and high frequency waves of pressure.

As arcs cannot be eliminated in the normal functioning of control and switching apparatus and as ignition is possible from the abnormal causes above enumerated, the problem then is to render harmless the explosion resulting from such ignition.

Experience and careful laboratory tests have proven that gas-tight conduit systems and enclosures for electrical apparatus are impractical. The necessary joints cannot be maintained in a permanently gas-tight condition. Therefore, it must be expected that eventually the explosive vapors will enter either by slow diffusion through the joints, or through pores in the metal, or by "breathing" of the conduit system. Vapors also may enter whenever the enclosures are opened for servicing the apparatus.

This being so, precautions must be taken to restrain the probable explosion within the enclosure and prevent ignition of the surrounding explosive atmospheres.

Therefore, the requirements for an explosion-proof enclosure are that it shall:

- (1)—Resist the explosive pressure by (a)—Strength of walls, and (b)—Strength of fastenings;
- (2)—Prevent escape of flame through (a)—Joints, (b)—Operating shaft openings, and (c)—Screw, rivet, and conduit openings.

In a location where the hazard is from flammable dust or flyings, care must be taken in the design of the apparatus so that the maximum temperature attained will be well below the ignition point of the flammable material. Also the design must be dust-shedding as far as practical to prevent accumulation of the flying material. Heavy dust deposits may result in raising the temperature to the danger point and making an otherwise safe device unsafe.

The wiring distribution system must be the best. For this, rigid conduit with threaded joints has no equal. It protects the conductors from mechanical injury, is strong enough to withstand pressures developed by internal explosions, and the threaded joints are adequate flame arrestors.

Obviously, means must be provided to prevent explosions occurring in one device from traveling through the conduit system to another location.

The conduit system and apparatus must be grounded in accordance with the requirements of Article 32 of the National Electrical Code. Conduit and apparatus so grounded cannot become a hazard due to insulation failure or static charges.

Greater safety is assured in hazardous locations if the electrical distribution system is of the grounded type, since the insulation cannot then be subjected to abnormal voltage stresses, either from accidental contact with high voltage circuits, or from static.

Certain precautions must be observed in servicing equipment in hazardous locations. For example, in the presence of explosive atmospheres no enclosure containing exposed current-carrying parts should be entered while any circuits within or leading to it are alive. Lighting fixtures or other devices supplied through three-way and/or four-way switches may not be killed by operation of such switches. Before re-lamping or entering the enclosures, the circuit should be killed by a positive off-and-on switch back on the line, disconnecting all wires.

Considerable information concerning the application of explosion-proof Condulets in hazardous locations, sizes of conductors, ratings of protective devices, and other such technical data is published in this section, for the convenience of our customers. Special care has been taken to insure the correctness of such information; but its correctness and freedom from error is not guaranteed, and the Crouse-Hinds Company cannot assume financial responsibility for loss or damage which may result from its use.

**Note:** Instructive application diagrams are shown on pages 5, 6, 31, 32, and 63 of this section. Additional information regarding wiring in hazardous locations will be furnished on request.



CROUSE-HINDS

# Hazardous Locations

## N. E. Code Analysis—Selection of Apparatus for Installations

Code Definition	Class I	Class II Groups E and F Conductive Dusts
	Class I locations are those in which flammable volatile liquids, highly flammable gases, mixtures, or other highly flammable substances are manufactured, used, handled, or stored in other than their original containers.	Class II locations are those in which (1) combustible dust is thrown, or is likely to be thrown, into suspension in the air in sufficient quantities to produce explosive mixtures, or (2) those where it is impracticable to prevent such combustible dust from collecting in such quantities on or in motors, lamps, or other electrical devices that they are likely to become overheated because normal radiation is prevented.
Type of Apparatus and Explanation	<b>Explosion-Proof</b> Withstands internal explosion—prevents escape of flame.	<b>Dust-Tight</b> Excludes dust from hot or arcing parts—operates cool under dust blanket.
Group Listings (For Atmospheres Containing:)	C:—Ethyl Ether. D:—Gasoline, Naphtha, Petroleum, Benzol, Alcohols, Acetone, Lacquer Solvents, Natural Gas, Etc.	E:—Metal Dust. F:—Carbon Black, Coal, Coke Dust.
Type of Industries Affected	Oil:—Refineries, Bulk and Service Stations. Nitro-Cellulose. Chemical Laboratories, Distilleries, Utilities, Hospitals, Dry Cleaning, Paint Spraying, Etc.	Coal Pulverizing Plants, Coke or Carbon Black Plants, Magnesium, Aluminum, and Bronze Powder Plants, Etc.

## Application of Condulets

Wiring Method	Threaded Rigid Conduit	Threaded Rigid Conduit
Outlets and Fittings	GU, GUA, GUB, GUE, GUF, GUP, ECF, ECG, EYS, EZS, UNA, UNF, UNL, UNY.	GU, GUA, GUB, GUE, GUF, GUP, ECF, ECG, EYS, EZS, UNA, UNF, UNL, UNY.
Circuit Breakers	EFS*, FLB, FLDC*	DVS, FLB, FLDC*, FS*
Panelboards	FLP, GUB	DVP, FLP, GUB
Switches	EFS, FLDC, FLS	FLDC, FLS, FS
Motor Starters	FLF, FLM	DVM, FLF, FLM
Plug Receptacles	Delayed-Action <i>Arktite</i> (CES-CPH, CPS-CPP) FSQ with BP or FP Plugs	FSQ Form 9, with FP Form 9 Plugs
Lighting Fixtures	EV, RCDE	.....
Lighting Fixture Hangers	ECF	ECF

\*For use in addition to the protective devices required by the National Electrical Code.



## CROUSE-HINDS

## Hazardous Locations

## N. E. Code Analysis—Selection of Apparatus for Installations

	Class II Group G Non-Conductive Dusts	Class III	Class IV
Code Definition	Class II locations are those in which (1) combustible dust is thrown, or is likely to be thrown, into suspension in the air in sufficient quantities to produce explosive mixtures, or (2) those where it is impracticable to prevent such combustible dust from collecting in such quantities on or in motors, lamps, or other electrical devices that they are likely to become overheated because normal radiation is prevented.	Class III locations are those in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used, and which are hazardous through such fibers or flyings collecting on or being ignited by arcing contacts, resistors, lamps, or similar apparatus. For combustible fiber warehouses, see Class IV.	Class IV locations are those in which easily ignitable combustible fibers are stored or handled (except in rooms where in process of manufacture) and which are hazardous through such fibers being ignited by arcing contacts, resistors, lamps, or similar apparatus.
Type of Apparatus and Explanation	Dust-Tight Excludes dust from hot or arcing parts — operates cool under dust blanket.	Dust-Tight Excludes dust from hot or arcing parts—operates cool under dust blanket to prevent flash-fires.	Dust-Tight or Vaportight Excludes dust from hot or arcing parts.
Group Listings (For Atmospheres Containing:)	G:—Grain Dust.	No group listings necessary. Materials that can create rapid flash-fires: — Cotton, Cotton Waste, Kapok, Jute, Hemp, Sisal, Oakum, Ixle, Excelsior, Etc.	No group listings necessary. Storage of materials that can create rapid flash-fires: — Cotton, Cotton Waste, Kapok, Jute, Hemp, Sisal, Oakum, Ixle, Excelsior, Etc.
Type of Industries Affected	Grain, Feed, and Flour Mills and Elevators; Wood Flour, Starch, Sugar, Fertilizer, and Linoleum Works; Breweries; Cork and Sulphur Users; Etc.	Manufacturing:— Cotton:—Gins, Picking. Rope Manufacturers. Mattress:—Upholstery—Linters. Textile:—Lint Dept. Etc.	Warehousing:— Commercial Warehouses. Dock and Terminal Warehouses. Manufacturers' Warehouses. Etc.

## Application of Condulets

Wiring Method	Threaded Rigid Conduit	Threaded Rigid Conduit	Threaded Rigid Conduit
Outlets and Fittings	Obround, Etc.	Obround, Etc.	Obround, Etc.
Circuit Breakers	DVS, FLB, FLDC*, FS*	DVS, FLDC*, FS*	DVS, FLDC*, FS*
Panelboards	DVP	DVP	DVP
Switches	FLDC, FLS, FS	FLDC, FLS, FS	FLDC, FLS, FS
Motor Starters	DVM, FLF, FLM	DVM	DVM
Plug Receptacles	FSQ with BP or FP Plugs	Arktite (AR—AP) FSQ with BP or FP Plugs	Arktite (AR—AP) FSQ with BP or FP Plugs
Lighting Fixtures	ADD-12, DL	ADD-12, DL	ADD-12, DL, V
Lighting Fixture Hangers	ECF	AHG, H1102, H1103, H1104, H1111	AHG, H1102, H1103, H1104, H1111

\*For use in addition to the protective devices required by the National Electrical Code.



CROUSE-HINDS

# Explosion-Proof EV Series Lighting Fixture Condulets\*

Class I, Groups C and D



Type EVA—Pendent Type  
Suspended from GUFT Condulet and  
GUA Canopy

The N. E. Code requires that the globe of a lighting fixture in hazardous locations shall be protected by a guard when exposed to mechanical injury. EV series fixtures are listed with guards to comply with this requirement, and without guards for use where they are not exposed to mechanical injury.

**Hoods:** Cast aluminum, equipped with etched Alzak aluminum inner reflectors which reflect the light that would otherwise be absorbed by the fixture.

**Globe Holder Assemblies:** Consist of the clear, Pyrex, impact-resisting glass globe, which is equipped with sheet aluminum gasket, and the cast aluminum mounting and retaining rings. All joints in the fixtures, except those between the globes and the globe holder assemblies, are threaded and locked with set screws. Cast aluminum guards are held to globe mounting rings by machine

EV series lighting fixture Condulets are made for use in Class I hazardous locations where a broken lamp or an accidental ground or short circuit in the lamp receptacle or wires might cause an explosion with ordinary lighting fixtures.

It is impossible to produce a lighting fixture which will permanently exclude a surrounding explosive gas, but EV series fixtures are ingeniously constructed to prevent any explosion which may occur within the fixture from being communicated to the surrounding atmosphere.

The castings and glass globes are strong enough to withstand any internal explosion and the threaded joints are tight enough to prevent escape of flame resulting from the explosion. The wiring compartment and lamp are separated by an explosion-proof threaded joint, which prevents an explosion that may occur in either compartment from being communicated to the other.



Type EVCX—Ceiling Type  
With Dome Reflector

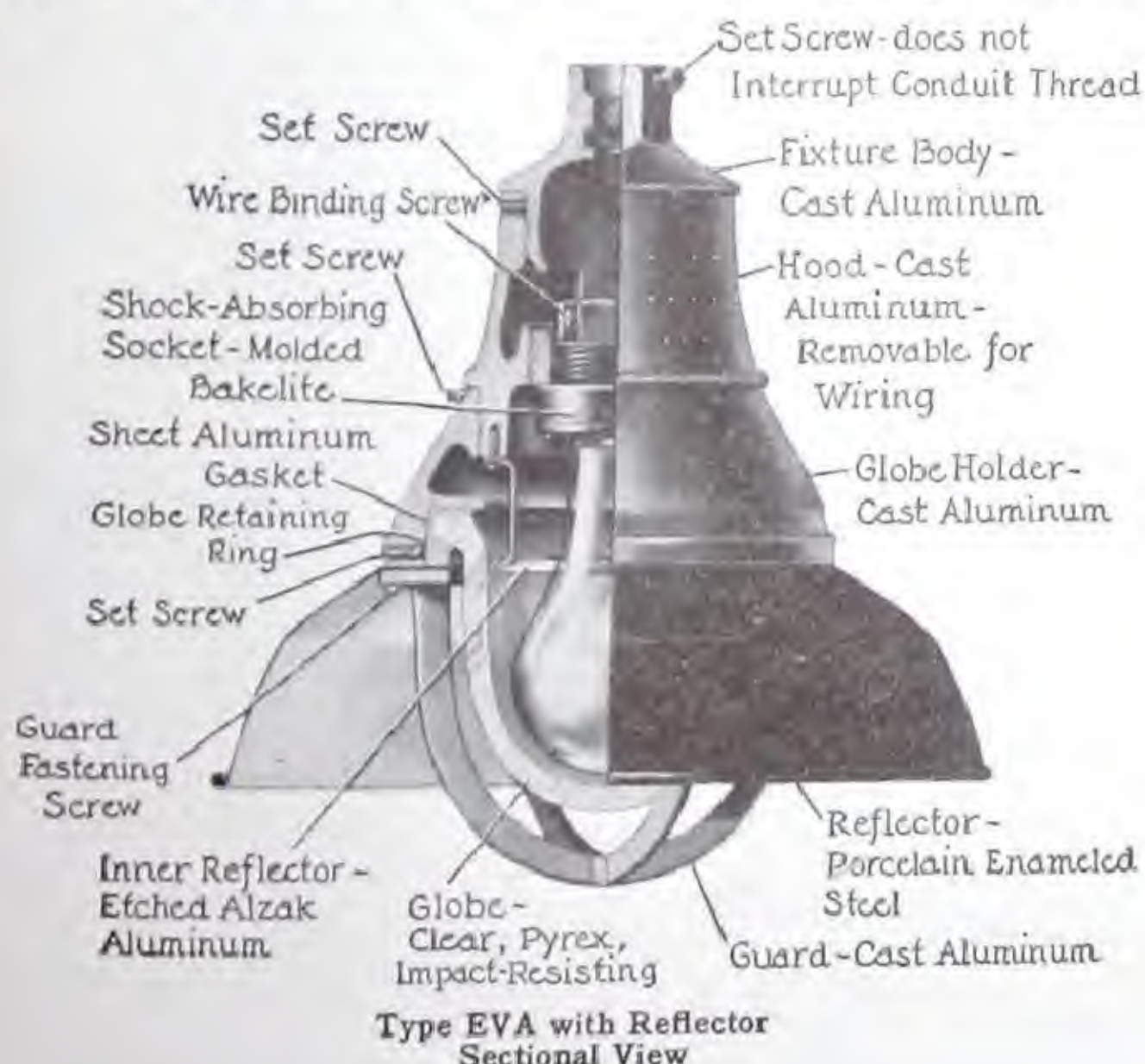
screws. Reflectors for 60 to 300-watt fixtures inclusive, when used, are held between the globe mounting rings and guards, or by the guard screws if the guard is omitted; reflectors for 500-watt fixtures are attached directly to the hood. For relamping, the globe holder assembly, including the guard and reflector except reflector for the 500-watt fixture, is removed as a complete unit.

**Bodies and Adapters:** In type EVA pendent fixtures, the cast aluminum body has a threaded hub with integral bushing for the conduit stem. The hub is equipped with a set screw which may be tightened against the unthreaded part of the stem to prevent the fixture from being loosened. The bodies of other types of fixtures in the EV series consist of cast Feraloy junction Condulets with cast Feraloy adapters (which correspond to the pendent type body) threaded into them and held from turning by set screws. These adapters and the pendent body have an opening in one side through which the circuit wires may be connected directly to the binding screw terminals of the lamp receptacle, which is threaded into the lower end of the body or adapters. The connections are made with the hood removed. The lamp receptacle is provided with an effective grip to prevent loosening of the lamp through vibration. The 200-watt and smaller fixtures are supplied with a shock-absorbing lamp receptacle.

Type EVA pendent fixtures may be suspended by a conduit stem from GUA or GUF series Condulets with 3-inch cover opening and GUA fixture covers or canopies.

Type EVCX is for use where it is necessary to mount the fixture close to the ceiling. Type EVBX is for side wall mounting. Four hubs tapped for rigid conduit are provided, three of which are equipped with threaded pipe plugs. This arrangement permits the Condulet to be used as a dead end, through feed, L, T, or X. The bracket type fixture projects far enough to allow room for a 30° angle reflector even when the conduit extends directly downward along the wall from the Condulet on which it is mounted.

Type EVJ is intended for direct mounting on side walls, and has hubs for horizontal conduit. It is especially suitable for use in lubrication pits where general light distribution is desired.











\*Denotes change in information.



**CROUSE-HINDS**

**Explosion-Proof  
EV Series Lighting Fixture Condulets\***  
Class I, Groups C and D

Type			EVA Pendent Type		EVCX Ceiling Type		EVBX Bracket Type		EVJ Bulkhead Type		Reflectors			
Description														
														
Size Lamp	Style	Size	Cat. No.	List, each	Cat. No.	List, each	Cat. No.	List, each	Cat. No.	List, each	Style	Dia.	Cat. No.	List, each
60-Watt	With Guard	1/2	EVA140	\$13.00	EVCX140	\$17.20	EVBX140	\$19.20	EVJ140	\$16.35	Dome	10 1/4	EV481	\$2.50
		3/4	EVA240	13.10	EVCX240	17.50	EVBX240	19.50	EVJ240	16.65	Deep	8 1/4	EV483	2.75
	Without Guard	1/2	EVA104	\$12.25	EVCX104	\$16.45	EVBX104	\$18.45	EVJ104	\$15.60	Shallow	10 1/4	EV485	2.25
		3/4	EVA204	12.35	EVCX204	16.75	EVBX204	18.75	EVJ204	15.90	30° Angle	8 1/4	EV487	2.75
100-Watt	With Guard	1/2	EVA110	\$19.40	EVCX110	\$23.70	EVBX110	\$25.70	EVJ110	\$24.80	Dome	12 1/8	EV181	\$2.75
		3/4	EVA210	19.50	EVCX210	24.00	EVBX210	26.00	EVJ210	25.00	Deep	9 1/4	EV183	3.00
	Without Guard	1/2	EVA101	\$18.40	EVCX101	\$22.70	EVBX101	\$24.70	EVJ101	\$23.80	Shallow	12 1/8	EV185	2.50
		3/4	EVA201	18.50	EVCX201	23.00	EVBX201	25.00	EVJ201	24.00	30° Angle	10 1/4	EV187	3.00
150-Watt	With Guard	1/2	EVA115	\$19.40	EVCX115	\$23.70	EVBX115	\$25.70	EVJ115	\$24.80	Dome	13 3/4	EV581	\$3.25
		3/4	EVA215	19.50	EVCX215	24.00	EVBX215	26.00	EVJ215	25.00	Deep	10 1/4	EV583	3.50
	Without Guard	1/2	EVA105	\$18.40	EVCX105	\$22.70	EVBX105	\$24.70	EVJ105	\$23.80	Shallow	13 3/4	EV585	3.00
		3/4	EVA205	18.50	EVCX205	23.00	EVBX205	25.00	EVJ205	24.00	30° Angle	12 1/8	EV587	3.50
200-Watt	With Guard	1/2	EVA120	\$27.90	EVCX120	\$32.20	EVBX120	\$34.20	EVJ120	\$33.50	Dome	16 1/16	EV281	\$3.75
		3/4	EVA220	28.00	EVCX220	32.50	EVBX220	34.50	EVJ220	33.70	Deep*	12 1/8	EV283	4.00
	Without Guard	1/2	EVA102	\$26.40	EVCX102	\$30.70	EVBX102	\$32.70	EVJ102	\$32.00	Shallow	16 1/16	EV285	3.50
		3/4	EVA202	26.50	EVCX202	31.00	EVBX202	33.00	EVJ202	32.20	30° Angle*	13 3/4	EV287	4.50
300-Watt	With Guard	1/2	.....	.....	EVCX136	\$67.00	.....	.....	.....	.....	Dome	20 7/16	EV381	\$6.50
		3/4	EVA230	\$62.50	EVCX236	67.10	.....	.....	.....	.....				
	Without Guard	1/2	.....	.....	EVCX163	\$61.25	.....	.....	.....	.....	30° Angle	16 1/16	EV387	4.50
		3/4	EVA203	\$56.75	EVCX263	61.35	.....	.....	.....	.....				
500-Watt	With Guard	1/2	.....	.....	EVCX150	\$78.00	.....	.....	.....	.....	Dome	20 1/2	EV681	\$6.50
		3/4	EVA450	\$73.50	EVCX250	78.10	.....	.....	.....	.....				
	Without Guard	1/2	.....	.....	EVCX106	\$73.70	.....	.....	.....	.....				
		3/4	EVA406	\$69.20	EVCX206	73.80	.....	.....	.....	.....				

**Overall Dimensions**

Cat. No.	Length	Width	Cat. No.	Length	Width	Cat. No.	Length	Width	Cat. No.	Length	Width
EVA210	12 7/16	6 7/8	EVBX210	15	12 1/4	EVCX210	12 1/8	6 7/8	EVJ210	13 3/4	9
EVA215	12 15/16	7 1/8	EVBX215	15 5/8	12 3/8	EVCX215	13	7 1/8	EVJ215	14 1/4	9 1/4
EVA220	14 9/16	8 1/2	EVBX220	17 1/8	13	EVCX220	14 1/32	8 1/2	EVJ220	15 7/8	10 1/8
EVA230	17 1/16	10	EVBX240	13	11 5/8	EVCX236	16 1/4	10	EVJ240	11 7/8	8 1/8
EVA240	10 3/8	5 3/4	.....	.....	.....	EVCX240	10 9/16	5 3/4	.....	.....	.....
EVA450	17 3/4	14	.....	.....	.....	EVCX250	17 5/16	14	.....	.....	.....





Reflectors are porcelain enameled steel, green outside and white inside.  
If specified on the order, 300-watt EV series lighting fixture Condulets can be furnished equipped with a Mogul base 3-contact receptacle for 2-filament lamps. Add Suffix S4 to the catalog number and \$1.25 to the list price.  
If specified on the order, EV series lighting fixture Condulets can be furnished with "inside frosted" globes. Add Suffix S10 to the catalog number and \$1.50 to the list price.  
If specified on the order, 60 to 200-watt inclusive EV series lighting fixture Condulets can be furnished equipped with aluminum half shades having etched Alzak finish. Add Suffix S130 to the catalog number and \$2.25 to the list price of 60, 100, 150-watt and \$2.50 to the list price of 200-watt sizes.  
\*200-watt types EVBX and EVJ fixtures take deep bowl and 30° angle reflectors only.  
•Denotes revised listing and addition.



CROUSE-HINDS

# Explosion-Proof EVA Lighting Fixture Condulets with Reflector

Class I, Groups C and D

Description			With Dome Reflector		With Deep Bowl Reflector		With Shallow Bowl Reflector		With 30° Angle Reflector	
										
Size Lamp	Style	Size	Cat. No.	List, each	Cat. No.	List, each	Cat. No.	List, each	Cat. No.	List, each
60-Watt	With Guard	1/2 3/4	EVA1401 EVA2401	\$15.50 15.60	EVA1403 EVA2403	\$15.75 15.85	EVA1405 EVA2405	\$15.25 15.35	EVA1407 EVA2407	\$15.75 15.85
	Without Guard	1/2 3/4	EVA1041 EVA2041	\$14.75 14.85	EVA1043 EVA2043	\$15.00 15.10	EVA1045 EVA2045	\$14.50 14.60	EVA1047 EVA2047	\$15.00 15.10
100-Watt	With Guard	1/2 3/4	EVA1101 EVA2101	\$22.15 22.25	EVA1103 EVA2103	\$22.40 22.50	EVA1105 EVA2105	\$21.90 22.00	EVA1107 EVA2107	\$22.40 22.50
	Without Guard	1/2 3/4	EVA1011 EVA2011	\$21.15 21.25	EVA1013 EVA2013	\$21.40 21.50	EVA1015 EVA2015	\$20.90 21.00	EVA1017 EVA2017	\$21.40 21.50
150-Watt	With Guard	1/2 3/4	EVA1151 EVA2151	\$22.65 22.75	EVA1153 EVA2153	\$22.90 23.00	EVA1155 EVA2155	\$22.40 22.50	EVA1157 EVA2157	\$22.90 23.00
	Without Guard	1/2 3/4	EVA1051 EVA2051	\$21.65 21.75	EVA1053 EVA2053	\$21.90 22.00	EVA1055 EVA2055	\$21.40 21.50	EVA1057 EVA2057	\$21.90 22.00
200-Watt	With Guard	1/2 3/4	EVA1201 EVA2201	\$31.65 31.75	EVA1203 EVA2203	\$31.90 32.00	EVA1205 EVA2205	\$31.40 31.50	EVA1207 EVA2207	\$32.40 32.50
	Without Guard	1/2 3/4	EVA1021 EVA2021	\$30.15 30.25	EVA1023 EVA2023	\$30.40 30.50	EVA1025 EVA2025	\$29.90 30.00	EVA1027 EVA2027	\$30.90 31.00
300-Watt	With Guard	3/4	EVA2301	\$69.00	.....	.....	.....	.....	EVA2307	\$67.00
	Without Guard	3/4	EVA2031	\$63.25	.....	.....	.....	.....	EVA2037	\$61.25
500-Watt	With Guard	1 1/4	EVA4064	\$80.00	.....	.....	.....	.....	.....	.....
	Without Guard	1 1/4	EVA4061	\$75.70	.....	.....	.....	.....	.....	.....





Reflectors are porcelain enameled steel, green outside and white inside.  
If specified on the order, 300-watt type EVA Condulets can be furnished equipped with a Mogul base 3-contact receptacle for 2-filament lamps. Add Suffix S4 to the catalog number and \$1.25 to the list price.  
If specified on the order, type EVA Condulets can be furnished with "inside frosted" globes. Add Suffix S10 to the catalog number and \$1.50 to the list price.



CROUSE-HINDS

Explosion-Proof  
EVCX Lighting Fixture Condulets with Reflector

Class I, Groups C and D

Description			With Dome Reflector		With Deep Bowl Reflector		With Shallow Bowl Reflector		With 30° Angle Reflector	
										
Size Lamp	Style	Size	Cat. No.	List, each	Cat. No.	List, each	Cat. No.	List, each	Cat. No.	List, each
60-Watt	With Guard	1/2 3/4	EVCX1401 EVCX2401	\$19.70 20.00	EVCX1403 EVCX2403	\$19.95 20.25	EVCX1405 EVCX2405	\$19.45 19.75	EVCX1407 EVCX2407	\$19.95 20.25
	Without Guard	1/2 3/4	EVCX1041 EVCX2041	\$18.95 19.25	EVCX1043 EVCX2043	\$19.20 19.50	EVCX1045 EVCX2045	\$18.70 19.00	EVCX1047 EVCX2047	\$19.20 19.50
100-Watt	With Guard	1/2 3/4	EVCX1101 EVCX2101	\$26.45 26.75	EVCX1103 EVCX2103	\$26.70 27.00	EVCX1105 EVCX2105	\$26.20 26.50	EVCX1107 EVCX2107	\$26.70 27.00
	Without Guard	1/2 3/4	EVCX1011 EVCX2011	\$25.45 25.75	EVCX1013 EVCX2013	\$25.70 26.00	EVCX1015 EVCX2015	\$25.20 25.50	EVCX1017 EVCX2017	\$25.70 26.00
150-Watt	With Guard	1/2 3/4	EVCX1151 EVCX2151	\$26.95 27.25	EVCX1153 EVCX2153	\$27.20 27.50	EVCX1155 EVCX2155	\$26.70 27.00	EVCX1157 EVCX2157	\$27.20 27.50
	Without Guard	1/2 3/4	EVCX1051 EVCX2051	\$25.95 26.25	EVCX1053 EVCX2053	\$26.20 26.50	EVCX1055 EVCX2055	\$25.70 26.00	EVCX1057 EVCX2057	\$26.20 26.50
200-Watt	With Guard	1/2 3/4	EVCX1201 EVCX2201	\$35.95 36.25	EVCX1203 EVCX2203	\$36.20 36.50	EVCX1205 EVCX2205	\$35.70 36.00	EVCX1207 EVCX2207	\$36.70 37.00
	Without Guard	1/2 3/4	EVCX1021 EVCX2021	\$34.45 34.75	EVCX1023 EVCX2023	\$34.70 35.00	EVCX1025 EVCX2025	\$34.20 34.50	EVCX1027 EVCX2027	\$35.20 35.50
300-Watt	With Guard	1/2 3/4	EVCX1301 EVCX2301	\$73.50 73.60	.....	.....	.....	.....	EVCX1307 EVCX2307	\$71.50 71.60
	Without Guard	1/2 3/4	EVCX1031 EVCX2031	\$67.75 67.85	.....	.....	.....	.....	EVCX1037 EVCX2037	\$65.75 65.85
500-Watt	With Guard	1/2 3/4	EVCX1064 EVCX2064	\$84.50 84.60	.....	.....	.....	.....	.....	.....
	Without Guard	1/2 3/4	EVCX1061 EVCX2061	\$80.20 80.30	.....	.....	.....	.....	.....	.....

Reflectors are porcelain-enamelled steel.

Reflectors are porcelain enameled steel, green outside and white inside.  
If specified on the order, 300-watt type EVCX Condulets can be furnished equipped with a Mogul base 3-contact receptacle for 2-filament lamps. Add Suffix S4 to the catalog number and \$1.25 to the list price.  
If specified on the order, type EVCX Condulets can be furnished with "inside frosted" globes. Add Suffix S10 to the catalog number and \$1.50 to the list price.



**CROUSE-HINDS**

**Explosion-Proof  
Type EVA Lighting Fixture Condulet**  
Class I, Group D

Type EVA Condulet is furnished with Lens EV50 and Guard EV085, and takes 300, 400, or 500-Watt Lamps, or any Mogul Base Lamp not exceeding 5 x 9 13/16 Inches, or 500-Watt



The 500-watt explosion-proof lighting fixture Condulet listed on this page is similar in purpose and general description to those described on page 13 and listed on page 14. However, the appearance and detail construction are somewhat different on account of the increased size and larger amount of heat dissipation required.

The fixture is furnished with a reflector (mounted inside of the unit) and with a bowl-shaped lens, instead of a globe.

The process of relamping is simplified by the provision of a threaded cover opening near the top of the fixture housing, through which the lamp bulb can be removed and replaced. This makes it unnecessary to remove the lens, housing, and reflector assembly for the purpose of relamping, which would be rather difficult due to the increased size of the fixture, especially if mounted at a considerable height above the floor.

The lens is mounted in a metal ring by a special process. In case of breakage of the lens the entire lens assembly has to be replaced.

Type EVA should be mounted vertically or not more than 25° from the vertical position, (Lamp base up).

Type	Description	Size	500-Watt	
			Cat. No.	List, each
EVA	Max. Lamp, 500 Watts	1 1/4	EVA459	\$120.00

**Guard and Coupling  
For Type EVA Condulet**



Guard	Wire Guard		
		EV085	\$4.30

The use of a flexible coupling in the supporting stem of a lighting fixture permits the fixture to assume a vertical position by gravity, and also protects the supporting stem and its connections against undue lateral stresses due to swaying of the fixture.

ECF44 explosion-proof flexible coupling consists of two 1 1/4-inch male nipples and a short length of strong, highly flexible metallic tubing, protected with a double wire braid.

The inside diameter is somewhat greater than that of 1/2-inch conduit. The free length of flexible tubing between nipples is about 4 inches, while the overall length is about 12 inches. The nipples are hexagonal, and provide a wide wrench grip to facilitate screwing into the fixture and into the canopy, coupling, or conduit fitting.



Coupling	Flexible		
		ECF44	\$10.00

Other flexible couplings are listed in this section, page 60.

Overall Dimensions: Type EVA—Diameter, 16 1/4 inches; depth, 22 3/4 inches.



Type EVA Suspended from  
GUFC Condulet and GUA Canopy  
by ECF44 Flexible Coupling



Installation—Explosion-Proof Condulets in Mixing and Pumping Room of Gas Plant



CROUSE-HINDS

# Type EVH Hand Lamps\*—Explosion-Proof

Class I, Group D\*



Type EVH Hand Lamps are furnished with Lamp Receptacle, Globe, and Guard

Type EVH explosion-proof and dust-tight hand lamps are designed and constructed to provide the utmost safety, durability, and ease of wiring. Non-sparking metals are used. They have laminated Bakelite handles which provide a cool grip. The handle is firmly secured to the cast aluminum body, in which is mounted a keyless, composition lamp receptacle. The cast aluminum globe holder complete with clear, Pyrex, explosion-resisting globe is threaded on the body and locked to prevent loosening by vibration. The guard is a combination of cast bronze rings and copper clad wire bows. It is fastened to the globe holder by machine screws. For relamping, the globe holder, globe, and guard are removed as a unit. Removing any screws is unnecessary.



"Extra Hand Usage" three-conductor portable cord should be used with these lamps. The portable cord enters a cast aluminum terminal housing at the end of the handle through a flexible rubber bushing, which has a long sleeve to protect the cord from injury. A cast aluminum cord clamp is screwed onto the end of the terminal housing, thus compressing the tapered inner end of the flexible rubber bushing around the cord to provide a tight joint. The cord clamp is then tightened to provide a mechanical grip on the cord. Part of the long protecting sleeve of the rubber bushing acts as a cushion between the clamp and the cord.

Factory-installed wiring in the handle encloses the lamp receptacle and grounding terminal in the body to the terminals in the terminal housing which are equipped with lugs into which the cord conductors are to be soldered. The conductors are factory sealed at the opening from body to handle, thus effectively isolating the handle from the interior of the fixture. A substantial suspension hook is rigidly attached to the terminal housing on the handle.

Type	Dia. Cord	40-Watt		100-Watt	
		Takes 25 or 40-Watt Lamps		Takes 50, 60, 75, or 100-Watt Lamps	
		Cat. No.	List, each	Cat. No.	List, each
EVH	.375 to .625	EVH40M3	\$22.00	EVH100*	\$45.00
	Globes† (Clear)	EVH5†	\$8.30	EVH10†	\$12.00
	Globe with Holder . . . . .		4.00		6.50
	Credit for Holder . . . . .		\$4.30		\$ 5.50
	Difference (cost of globe replacement) . . . . .				
	Guards	EVH084M3	\$2.75	EVH087	\$3.50


# Type EVS Portable Lamps\*—Explosion-Proof

Class I, Group D

Type EVS Portable Lamps are furnished with Lamp Receptacle, Globe, and Guard



Type EVS portable lamps are of the same construction as the type EVA fixtures listed on page 14, with a handle assembly added. This handle assembly includes a hook and a substantial cable clamp. A third terminal is provided in type EVS for connection to a third wire in the portable cord for grounding the non-current-carrying metal parts of the entire unit.

Type	Dia. Cable	100-Watt		150-Watt		200-Watt	
		Takes 50, 60, 75, or 100-Watt Lamps		Takes 150-Watt Lamps		Takes 150 or 200-Watt Lamps	
		Cat. No.	List, each	Cat. No.	List, each	Cat. No.	List, each
EVS	.250 to .625	EVS80	\$23.00	EVS81	\$23.00	EVS82	\$32.00
	Globes† (Clear)	EV710†	\$12.00	EV715†	\$12.00	EV720†	\$20.00
	Globe with Holder . . . . .		6.50		6.50		10.00
	Credit for Holder . . . . .		\$ 5.50		\$ 5.50		\$10.00
	Difference (cost of globe replacement) . . . . .						

†Globes must be assembled in the threaded holder at the factory. Order Globe with Holder by catalog number. Invoice will be issued for "Globe with Holder;" and upon receipt of the old globe holder in good condition at Syracuse, charges prepaid, with or without the broken globe, a credit memorandum for the holder will be issued.

\*EVH40M3 is also dust-tight: Class II, Group G, and Classes III and IV. \*Denotes change in design and addition.



CROUSE-HINDS

# Type EVA Pilot and Sign Light Fixture Condulet

Explosion-Proof and Dust-Tight

Type EVA Condulet is furnished with Guard and Globe Assembly EV39 and Aluminum Gaskets, and takes 10-Watt Type S14 Lamps



Type EVA  
Pilot Light Fixture Condulet




Type EVA  
With Sign Attachment

The 10-watt explosion-proof and dust-tight pilot and sign light fixture Condulet listed on this page is similar in general description to type EVA described on page 13 of this section.



However, the appearance and detail construction are somewhat different in order to make the fixture especially suitable for use as an explosion-proof pilot or sign light where only a small amount of light is needed.

The fixture can be connected to explosion-proof switch, circuit breaker, or motor starting switch Condulets as listed in this section to act as an indicator to show from a distance whether the circuit is alive. The fixture can also be mounted in the usual manner wherever a pilot light for any purpose is needed in hazardous locations.

The fixture can be used as an illuminated sign by fastening the sign attachment to the fixture guard. The sign attachment has a plain (or red if so ordered) front glass backed by opal glass on which figures or letters not exceeding five characters may be placed.

Illustrations	Type	Size	10-Watt	
			Cat. No.	List, each
	EVA	1/2	EVA139	\$10.00

## Accessories For Type EVA Condulet

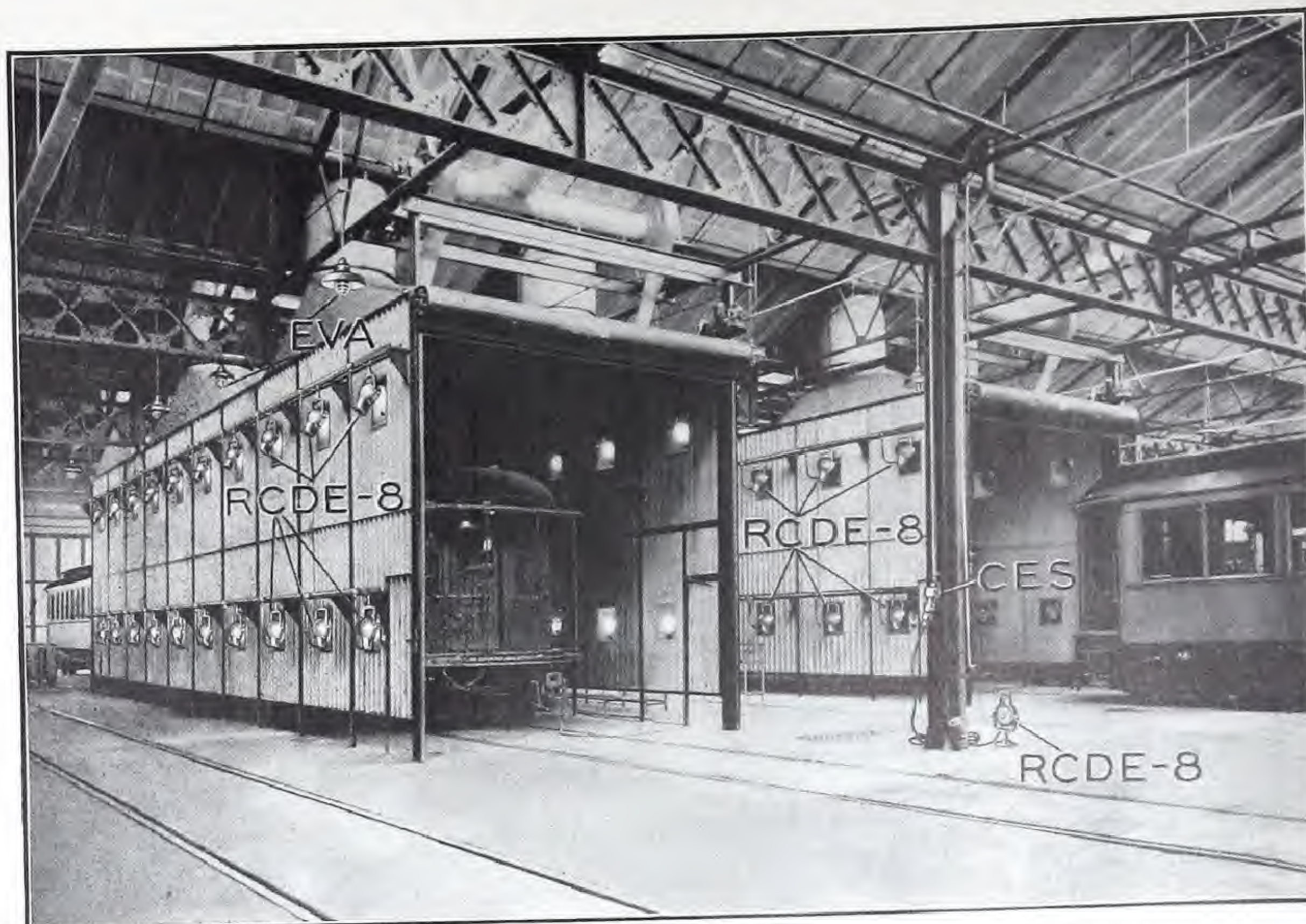
	Guard and Globe Assembly (Clear Globe)	..	EV39	\$5.50
	Sign Attachment†	..	EVNA03	\$4.00

†The sign attachment will be furnished with figures or letters not exceeding five characters at a charge of \$ .30 list per character.

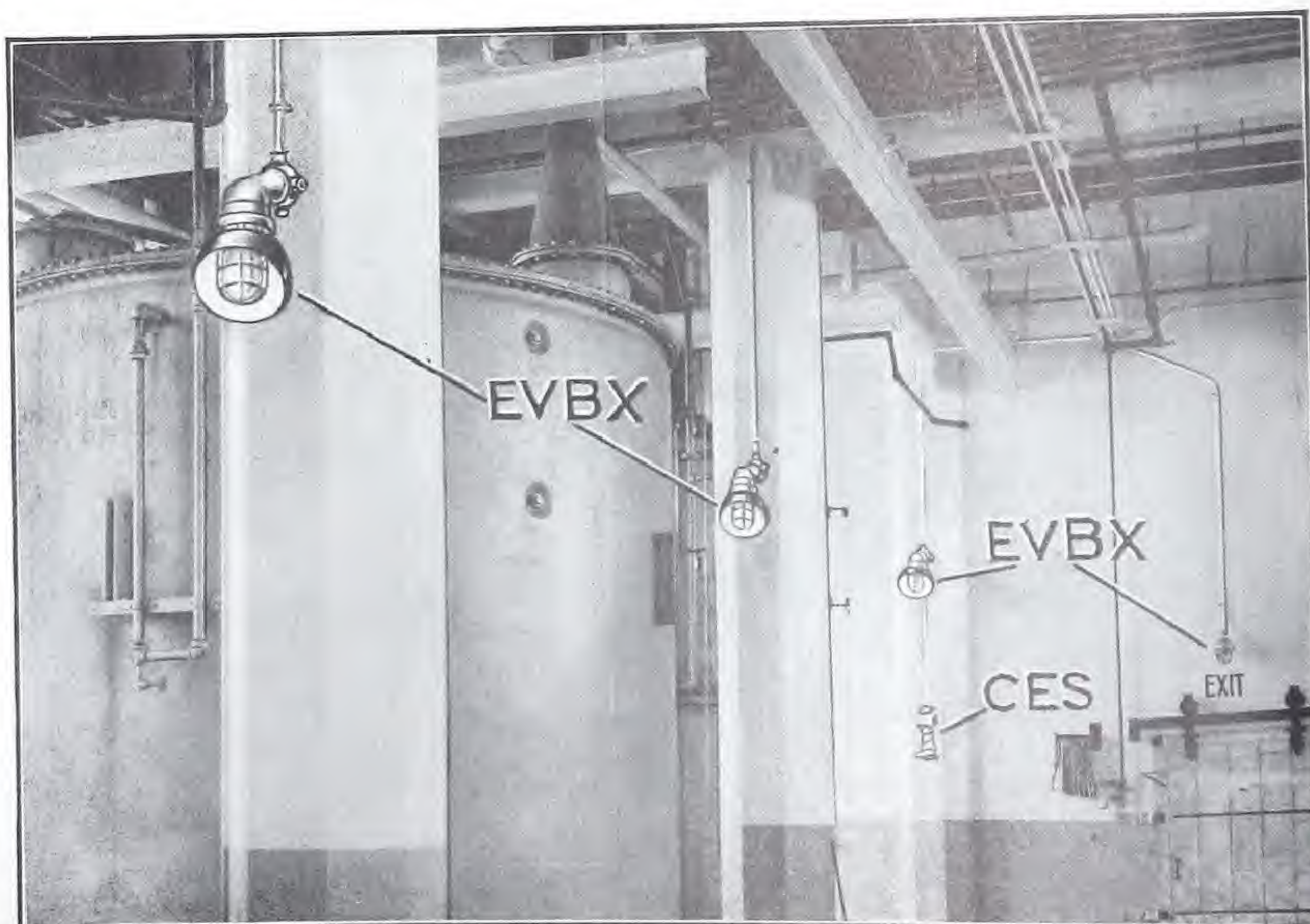
Overall Dimensions: Type EVA—Length, 8 1/16 inches; diameter, 4 inches. Sign Attachment—Width, 9 1/8 inches; depth, 3 1/16 inches.



CROUSE-HINDS



Installation—Explosion-Proof Condulets and Floodlights—Coach Spray Booth and Drying Room Area



Installation—Explosion-Proof Condulets in Storage Room of Chemical Plant



CROUSE-HINDS

**Dust-Tight and Vaportight  
DL Series Lighting Fixture Condulets**  
For Class II, Groups E, F, and G Hazardous Locations—When Mounted Vertically  
For Classes III and IV Hazardous Locations—When Mounted in any Position



Type DLC—Ceiling Type  
With Flat Cone Reflector  
Mounted on Type CPS Condulet



Type DLA—Pendent Type  
With Dome Reflector and  
Basket Guard. Suspended from  
Type CPS Condulet



Type DLB—Bracket Type  
Mounted on Type CPS Condulet

DL series lighting fixture Condulets exclude dust from the interior of the fixture and prevent accumulation of dust on the exterior where it might be overheated and cause the dust in the surrounding atmosphere to become ignited.

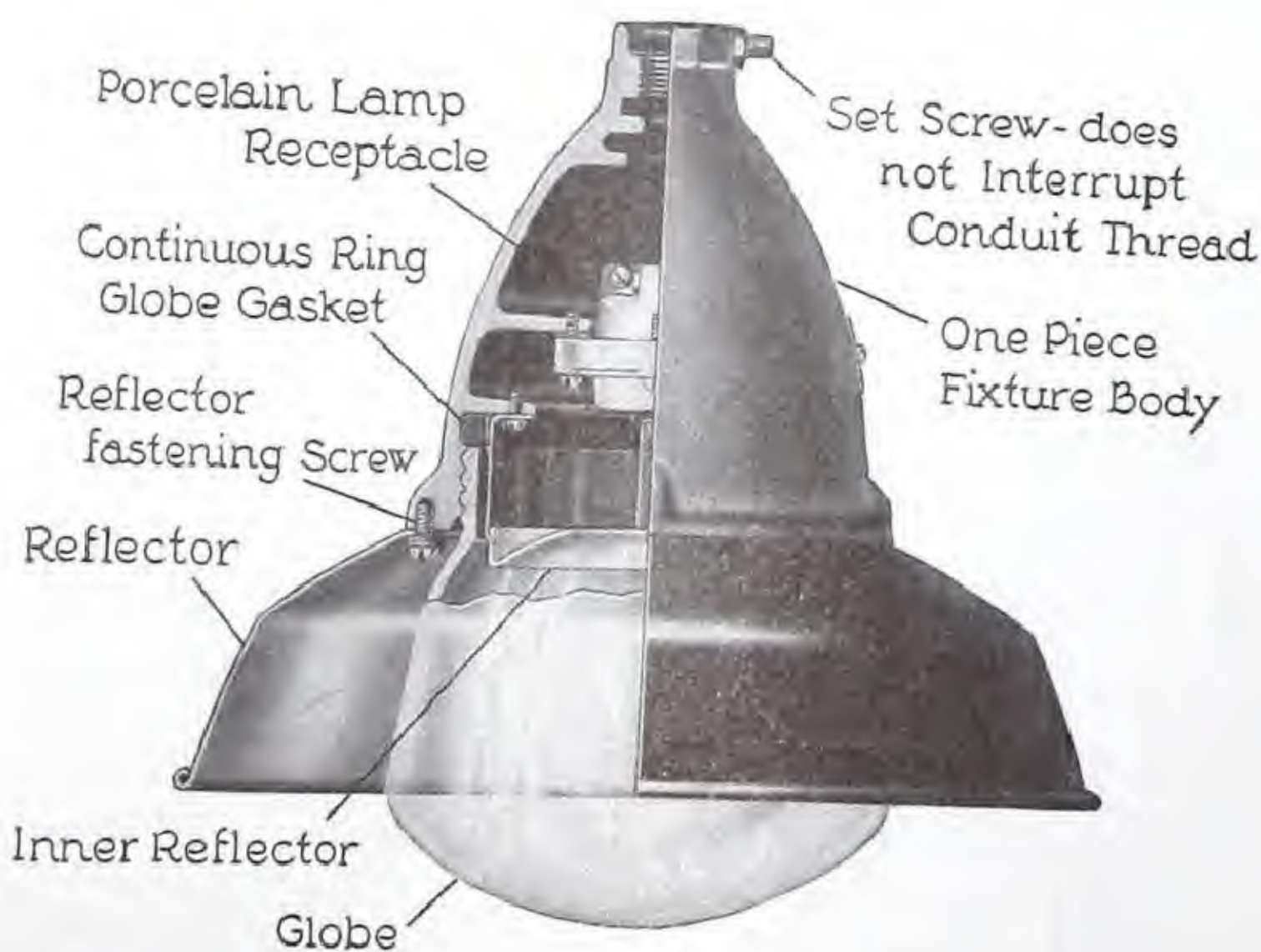
In these new DL series lighting fixture Condulets, the body and hood have been combined in one casting, thereby eliminating a joint. The threaded ring formerly used to attach reflectors to the hood has been discarded and the reflectors are now fastened by machine screws threading into a flange on the lower end of the body. This simplified construction improves both the appearance and dust-tightness of the Condulet.

The fixtures are made in three types for use under different installation conditions: Type DLC is for mounting on the ceiling or other horizontal surface; type DLA, for suspension from the ceiling by conduit or flexible support;

and type DLB, for mounting on the wall or other vertical surface. Types DLC and DLA may be equipped with various combinations of reflectors and guards to suit requirements.

Type DLC, ceiling type and type DLB, bracket type fixtures are made to mount directly on CPS series Condulets. Type DLA pendent type fixtures may be suspended from CPS series Condulets with hub covers. The body of type DLA fixture has one hub for threaded conduit in the top. This hub is equipped with a set screw to prevent the fixture from turning and loosening.

All fixtures are furnished with lamp receptacle, inner reflector, and clear globe. The fixtures can be relamped by removing the globe which screws into the hood and passes through a hinged door in the bottom of the basket guards.





Type DLA with Reflector  
Sectional View



**CROUSE-HINDS**


**Dust-Tight and Vaportight  
DL Series Lighting Fixture Condulets**  
For Class II, Groups E, F, and G Hazardous Locations—When Mounted Vertically  
For Classes III and IV Hazardous Locations—When Mounted in any Position

Furnished with Lamp Receptacle V46 and Globe





PENDENT TYPE					CEILING TYPE				
Illustrations	Type	Size	Cat. No.	List, each	Size Lamps	Cat. No.	List, each	Type	Illustrations
	DLA	1/2 3/4	DLA101 DLA201	\$ 9.70 9.70	100	DLC50F	\$9.70	DLC	
		1/2 3/4	DLA121 DLA221	\$11.35 11.35	150 or 200	DLC20F	\$11.35		

**BRACKET TYPE**

Furnished with DL1 Cover for CPS Series Condulets, Lamp Receptacle V46, and Globe

Type	Size Lamps	Cat. No.	List, each
	100	DLB11F	<sup>12.25</sup> \$14.55
	150 or 200	DLB21F	<sup>14.95</sup> \$17.95

Furnished with Porcelain Enameled Steel Reflector

PENDENT TYPE							CEILING TYPE				
	Type	Hub Size	Cat. No.	List, each	Reflector		Size Lamps	Cat. No.	List, each	Type	
					Dia.	Cat. No.					
	DLA (Dome)	1/2 3/4	DLA1020 DLA2020	\$11.50 11.50	12"	DL23	100	DLC720F	\$11.50	DLC (Dome)	
		1/2 3/4	DLA1022 DLA2022	\$16.50 16.50	18"	DL24	150 or 200	DLC722F	\$16.50		
	DLA (Flat Cone)	1/2 3/4	DLA1040 DLA2040	\$11.50 11.50	14"	DL43	100	DLC740F	\$11.50	DLC (Flat Cone)	
		1/2 3/4	DLA1042 DLA2042	\$15.40 15.40	18"	DL44	150 or 200	DLC742F	\$15.40		

CPS series Condulets are listed in section 85, page 18D.  
Reflectors are green porcelain enamel outside; and white porcelain enamel inside.





## "MASTER" Sign Reflector

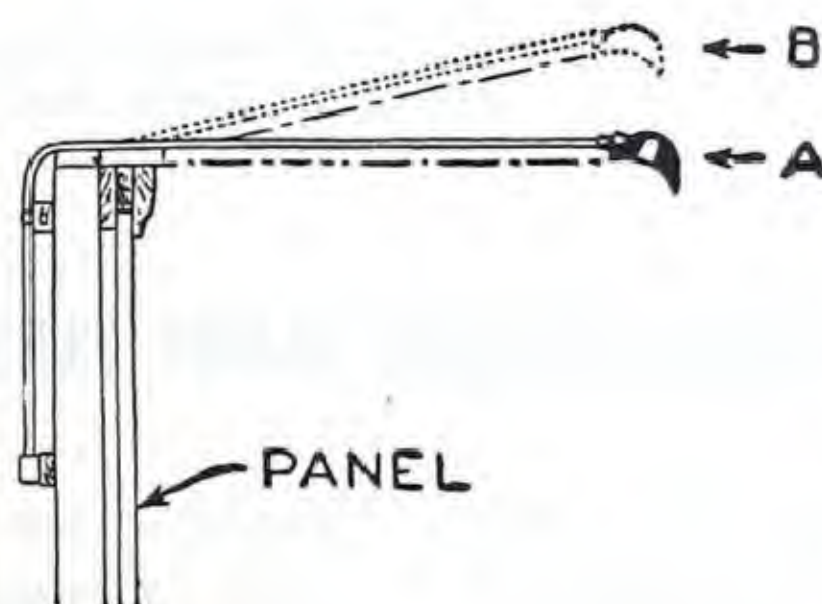
The "Master" Sign Reflector is the result of many years of pioneering and development in the field of sign illumination. It is particularly suitable for lighting large signs such as Standard and Three Sheet Poster Panels, Store and Highway Bulletins, Roof and Wall Signs.



### SPECIAL FEATURES

#### 1. Easy Installation—No Conduit Bends Between Reflector and Sign

Side outlet type of construction permits conduit to be led straight into reflector neck, as shown in position "A", eliminating the necessity for conduit bends, offsets, street ells or other attachments between reflector and panel. Reflector is designed for close-to-board mounting which makes for economy in installation.



#### 2. Flexibility of Reflector Position

Where desirable, reflectors may be raised from normal position "A" to position "B" as shown, by bending the conduit slightly upward at the board. Light distribution will not be affected as reflector cut-off follows the line of the conduit. Similarly, if reflectors sag slightly below normal position, no shadow will result across top of board.

#### 3. Uniform Lighting Coverage of Entire Board—No Scallops or Shadows

Light spillage is greatly reduced and shadows and scallops along top of panel are eliminated. The lamp filament lies in the flat plane of the front curve of the elliptical reflector shape, producing a long straight line cut-off which extends more than half way to the next reflector. Compare Diagram "A" representing distribution on a standard poster panel from three Units with "B" which is the same board lighted by three ordinary sign units.

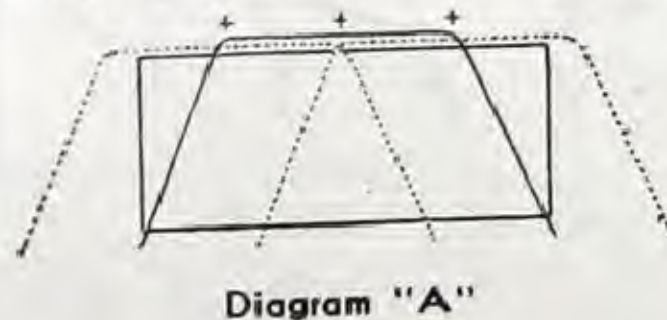


Diagram "A"



Diagram "B"

#### 4. Interchangeability of Lamps

If desirable a higher intensity of light can be had on a sign without changing reflectors, as either 100 or 150-watt lamp may be used in reflector No. 5570 and either 150 or 200-watt lamp in No. 5571. This can be done without appreciable raising or lowering of the cut-off.

#### 5. Inconspicuous on Board and Easy to Clean

The "Master" Sign Reflector is compact, neat appearing and very inconspicuous when installed. This compact construction tends to reduce resistance to wind stresses.

Porcelain interior can be as easily cleaned as a china dish.



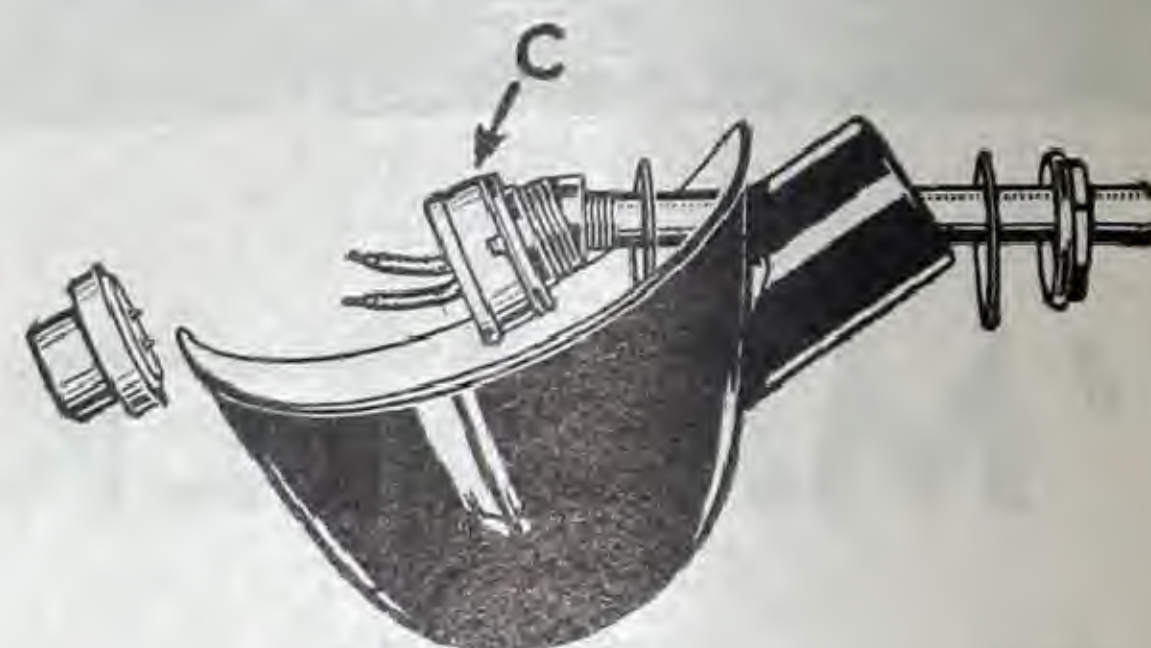


## Features and Specifications of "Master" Sign Reflector

### SPECIAL FEATURES (Cont.)

#### 6. Easy-to-Wire.

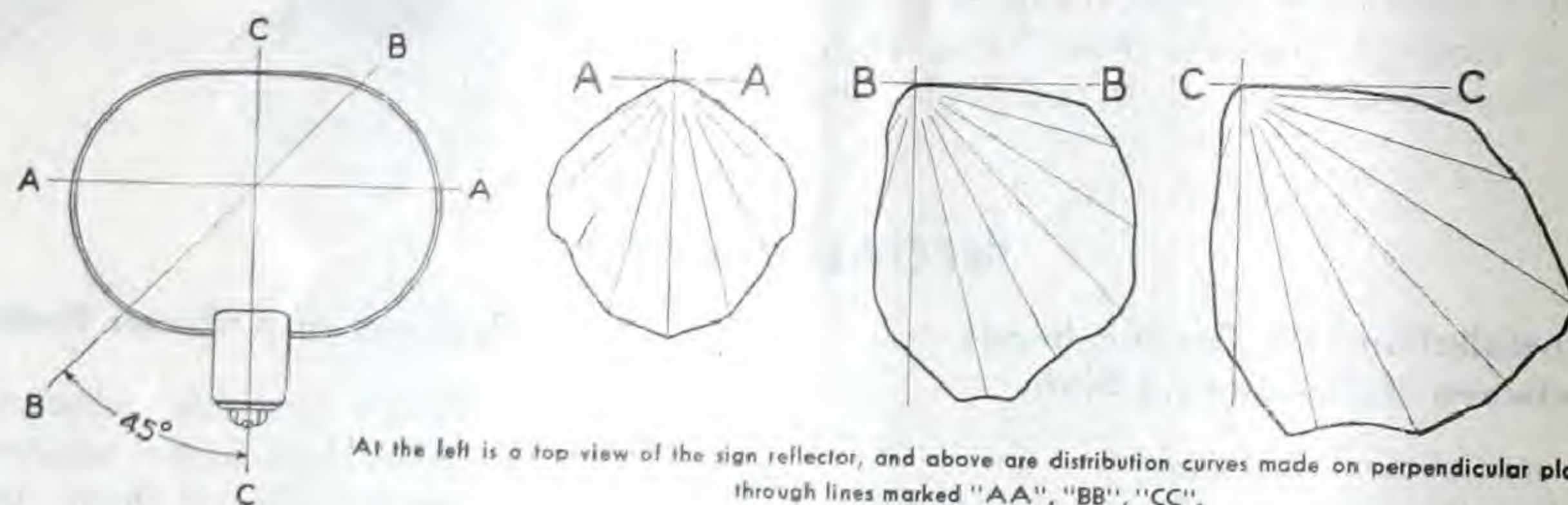
Illustration shows how new separable fitting allows reflector to be slipped back out of the way while wiring. Simply release two screws for quick attachment of leads to wiring terminals.



#### 7. Large Set Screw.

Large set screw allows permanent positioning of reflector on conduit at any desired point. Large set screw is very useful for guy wire attachment.

### TYPICAL DISTRIBUTION CURVES



### SPECIFICATIONS AND LISTINGS

**Convenient Packaging**—Reflectors are packed in units of two to a box. This packing eliminates the necessity of breaking open packages when sending them out for installation.

**Reflector**—Elliptical shape of porcelain enameled steel with side outlet.

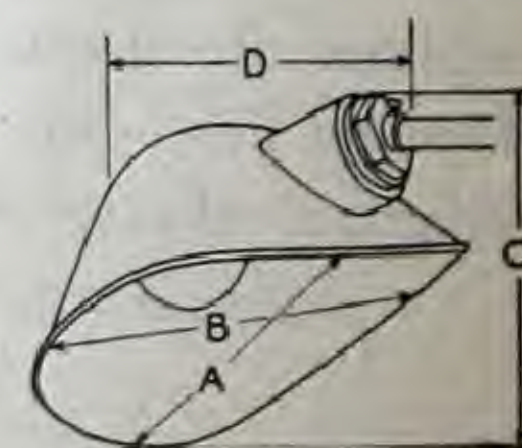
**Choice of Colors**—Reflectors are regularly finished green outside; reflecting white, inside. When specified, reflectors can be furnished with an outside finish of white, red, blue, yellow or any other standard stock color at an advance in list price.

**Standard Socket**—Cat. No. 44-S one-piece C.E.S.A.

standard porcelain, medium base rigid keyless socket with indented, threaded shell to retard loosening of lamps under vibration.

**Shock-Absorbing Socket**—Lengthens lamp life by protecting the filament from vibration. Supplied in place of rigid socket at advance in reflector list. To order, suffix reflector number with "SHB."

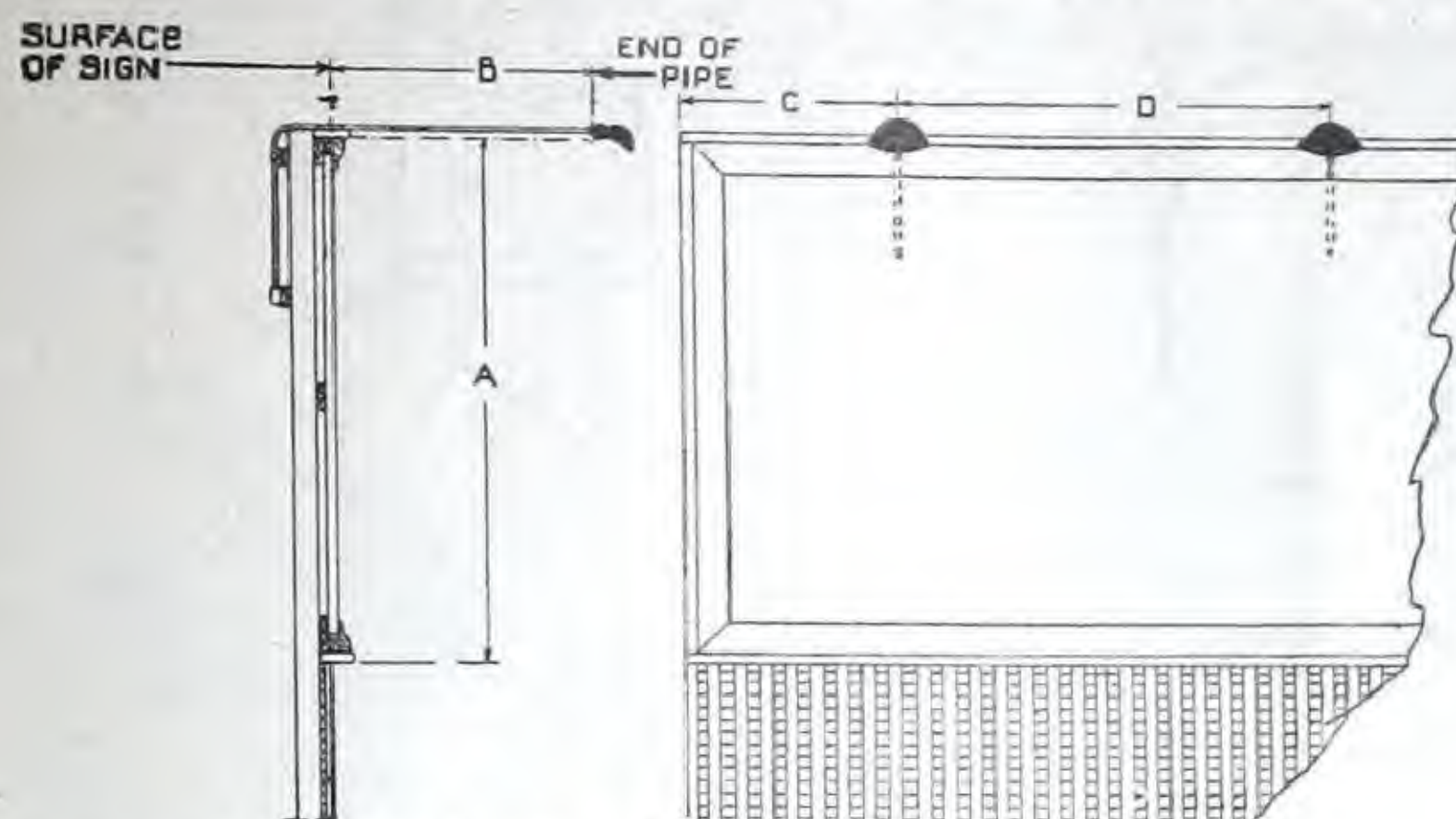
**Fitting**—Angle "X" style weatherproof separable fitting with set screw. Tapped  $\frac{1}{2}$  inch, standard;  $\frac{3}{4}$  inch, if specified, at no advance in list price.



SIZE OF LAMP, WATTS	CATALOG NO.	DIM. "B"	DIM. "A"	HGT. "C"	WIDTH "D"	STANDARD PACKAGE	SHPG. WT. LBS. STD. PKG.
100, 150	5570	13 $\frac{1}{2}$	9 $\frac{1}{8}$	8 $\frac{3}{4}$	8 $\frac{7}{8}$	2	7 $\frac{1}{2}$
150, 200	5571	13 $\frac{1}{2}$	9 $\frac{1}{8}$	9 $\frac{1}{4}$	10 $\frac{1}{8}$	2	8



# Installation Data for "Master" Sign ReflectorsFor Standard Poster Panels, Roof and Wall Signs



The tables below give proper spacing of reflectors on various types and sizes of signs, and also tell what size lamp to use. Reflector spacing must not exceed recommendations given in these tables. Closer spacing between reflectors will result in a more brilliantly lighted sign.

Diagram at the left gives the elevation and part of a standard bulletin board installation. Letters on the diagram refer to corresponding letters in the tables.

Reflector No. 5570 takes either 100 or 150 Watt Lamp. Reflector No. 5571 takes either 150 or 200 Watt Lamp. When 150 Watt Lamp is specified use No. 5571 Reflector so that if desired, sign may be brightened with 200 Watt Lamps.

**TABLE OF SPACING DISTANCES  
FOR STANDARD POSTER PANELS AND BULLETINS**

Kind of Board	A Size of Board	†No. of Reflectors Required	B Distance Out	C Distance from End	D Distance Apart	‡Size of Lamps, Watts		
						Bright Locations	Ordinary Locations	Dark Locations
Standard Poster Panel	11'10"x25'0"	3	5'0"	4'2"	8'4"	200 Watt	150 Watt	100 Watt
Three Sheet Poster Panel	8'0"x5'10"	1	4'0"	.....	.....	200 Watt	150 Watt	100 Watt
Standard Store Bulletin	11'6"x11'6"	2	5'0"	2'10"	5'10"	150 Watt	100 Watt	.....
	11'6"x16'5"	2	5'0"	4'1"	8'3"	200 Watt	150 Watt	100 Watt
	11'6"x21'4"	3	5'0"	3'7"	7'1"	200 Watt	150 Watt	100 Watt
	11'6"x26'3"	4	5'0"	3'3"	6'7"	200 Watt	150 Watt	100 Watt
Standard Highway Bulletin	12'6"x42'0"	5	5'3"	4'4"	8'4"	200 Watt	150 Watt	100 Watt
Standard City or Suburban Bulletin	12'6"x47'0"	6	5'3"	3'11"	7'10"	200 Watt	150 Watt	100 Watt
Railroad, Metropolitan or Highway Bulletin	18'0"x72'0"	6	8'6"	6'0"	12'0"	*500 Watt	*300 Watt	200 Watt
						*Takes Reflector No. 5537		

**TABLE OF SPACING DISTANCES  
FOR ROOF AND WALL SIGNS**

	A Height of Sign	B Distance Out	C Distance from End	D Distance Apart	‡Size of Lamps, Watts		
					Bright Locations	Ordinary Locations	Dark Locations
Roof or Wall Sign	2' to 4'	2'6"	2'6"	5'0"	100 Watt	.....	.....
	5' to 6'	3'6"	3'0"	6'0"	150 Watt	100 Watt	.....
	7' to 8'	4'0"	3'3"	6'6"	200 Watt	150 Watt	100 Watt
	9' to 12'	5'0"	4'0"	8'0"	.....	200 Watt	150 Watt
	13' to 15'	6'6"	5'0"	10'0"	.....	.....	200 Watt
	16' to 18'	8'6"	6'6"	13'0"	.....	.....	200 Watt

†For dark color boards, higher wattage lamps or more reflectors per board should be used to overcome light absorption.



## "Emblem" Sign Reflectors

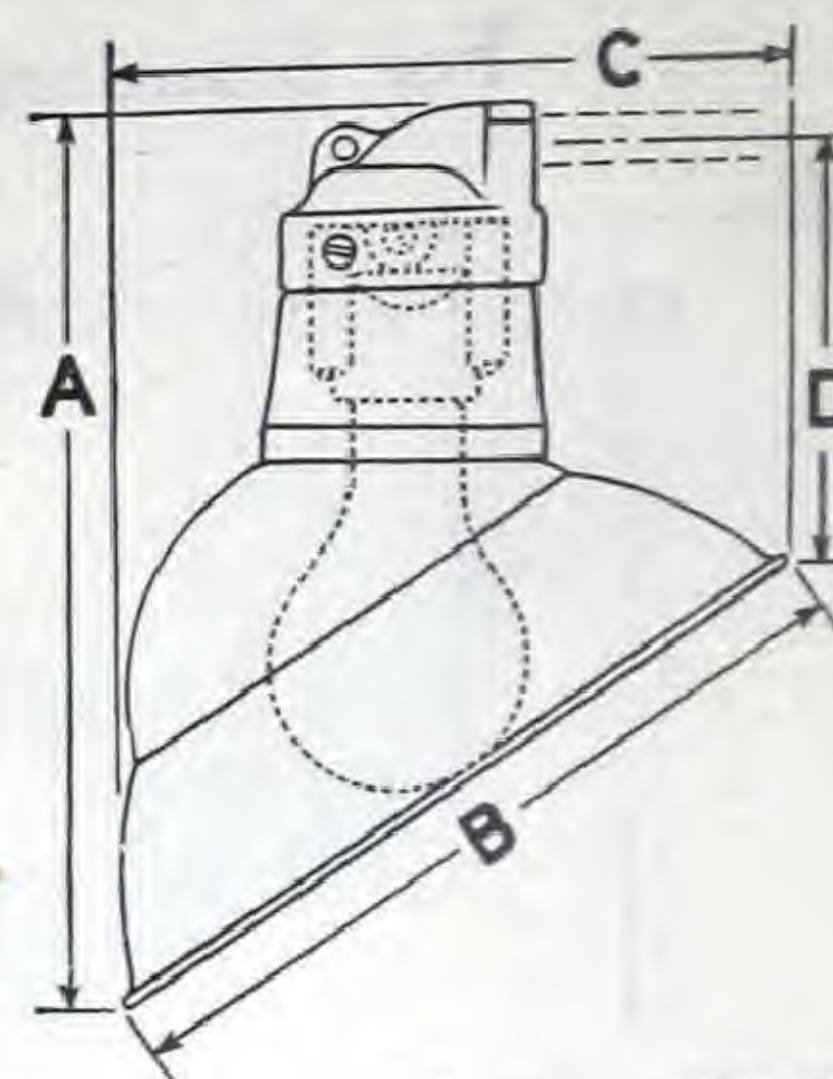
For Intensive Lighting of Circular Emblem and other Similar Small Signs



Cat. No. S1821-L



Typical Distribution Curve



SIZE OF LAMP, WATTS	CATALOG NO.	HGT. "A"	DIA. "B"	DIM. "C"	HGT. "D"	STD. PKG.	SHIP. WGT. STD. PKG.
50, 60	<b>S1821-L</b>	9 <sup>3</sup> / <sub>8</sub>	8	6 <sup>7</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>4</sub>	10	27 lbs.
75, 100	<b>S1822-L</b>	10 <sup>1</sup> / <sub>8</sub>	8	6 <sup>7</sup> / <sub>8</sub>	5	10	30 lbs.
150	<b>S1823-L</b>	12 <sup>5</sup> / <sub>8</sub>	10	9 <sup>1</sup> / <sub>8</sub>	6 <sup>1</sup> / <sub>4</sub>	10	35 lbs.

Shock-Absorbing Sockets, for prolonging lamp life, furnished in place of the regular rigid socket at a small advance in price.

### High Lighting Efficiency

The new Emblem Reflector is designed for lighting circular emblem signs of the type popularly used about gasoline filling stations, super-service stations and garages. Sign is uniformly and brilliantly illuminated and, due to the curved cut-off at the top, there is a minimum spillage of light beyond the sign.

### Easy to Install

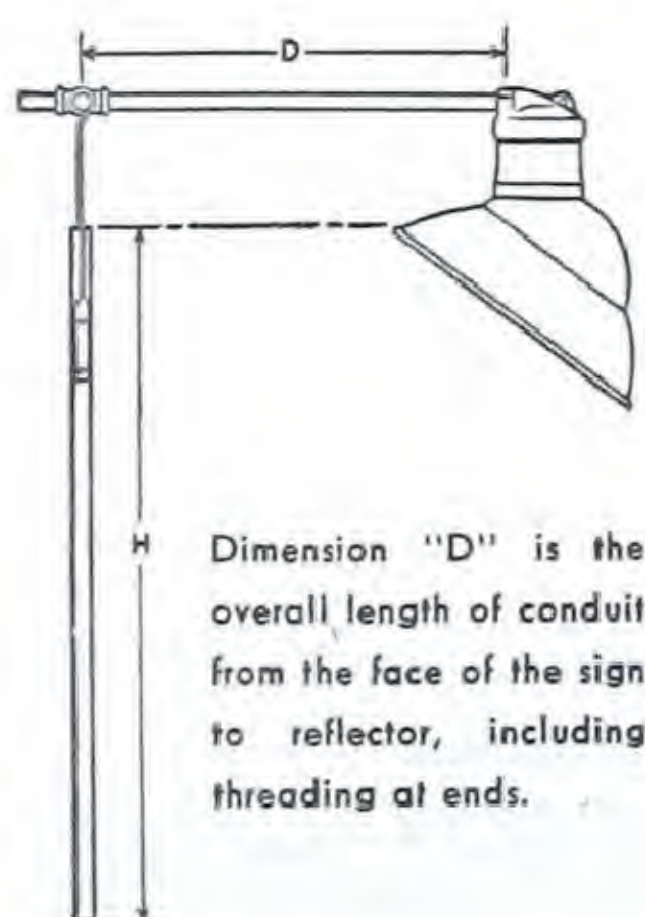
Installation time is reduced by the "1800 Series." Removable Reflector construction. Side outlet hood—no conduit bending. Hood is drilled for attaching guy wires.

### Neat and Inconspicuous

When installed as recommended, Emblem Reflectors are neat and inconspicuous and do not interfere with the readability of the sign, day or night.

### Construction

The hood is cast iron, electro-plated, with side outlet tapped 1/2-inch. One-piece porcelain socket, No. 2101. Reflector is porcelain enameled steel of efficient, symmetrical shape. Finish: reflector is green outside, white inside; available with red outside, when specified—refer to nearest District Sales Office for price.



Dimension "D" is the overall length of conduit from the face of the sign to reflector, including threading at ends.

### Mounting Data for Circular and Approximately Circular Signs

Signs of approximate sizes shown in the table are lighted suitably with one reflector on each side. Best results are obtained by centering the reflector in relation to the sign with the top edge of the reflector level with top of sign.

\*For dark-colored signs, or where higher intensities are desired, follow lamp recommendations for next brighter location.

"H" Height of Sign	"D" Distance Out from Sign	Lamp Size in Watts	
		Average	Bright
15"	7 <sup>1</sup> / <sub>2</sub> "	50	60
18"	9"	60	75
21"	10 <sup>1</sup> / <sub>2</sub> "	60	75
24"	12"	60	75
27"	13 <sup>1</sup> / <sub>2</sub> "	60	75
30"	15"	75	100
33"	16 <sup>1</sup> / <sub>2</sub> "	75	100
36"	18"	75	100
39"	19 <sup>1</sup> / <sub>2</sub> "	75	100
42"	21"	100	150
45"	22 <sup>1</sup> / <sub>2</sub> "	100	150
48"	24"	100	150

# Northern Electric

COMPANY LIMITED

HALIFAX SAINT JOHN, N.B. QU'EBEC TROIS RIVIERES SHERBROOKE MONTREAL OTTAWA VAL D'OR  
TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY PORT ARTHUR  
WINNIPEG REGINA CALGARY EDMONTON VERNON VANCOUVER VICTORIA





NOR-ELECTRIC



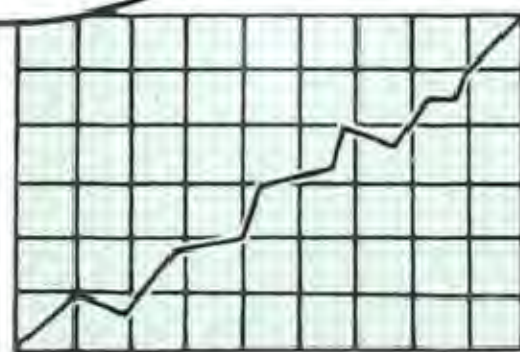
BULLETIN

ILLUMINATION

# FOSTORIA LOCALITES



LESS  
WASTAGE



INCREASED  
PRODUCTION



FEWER  
ACCIDENTS



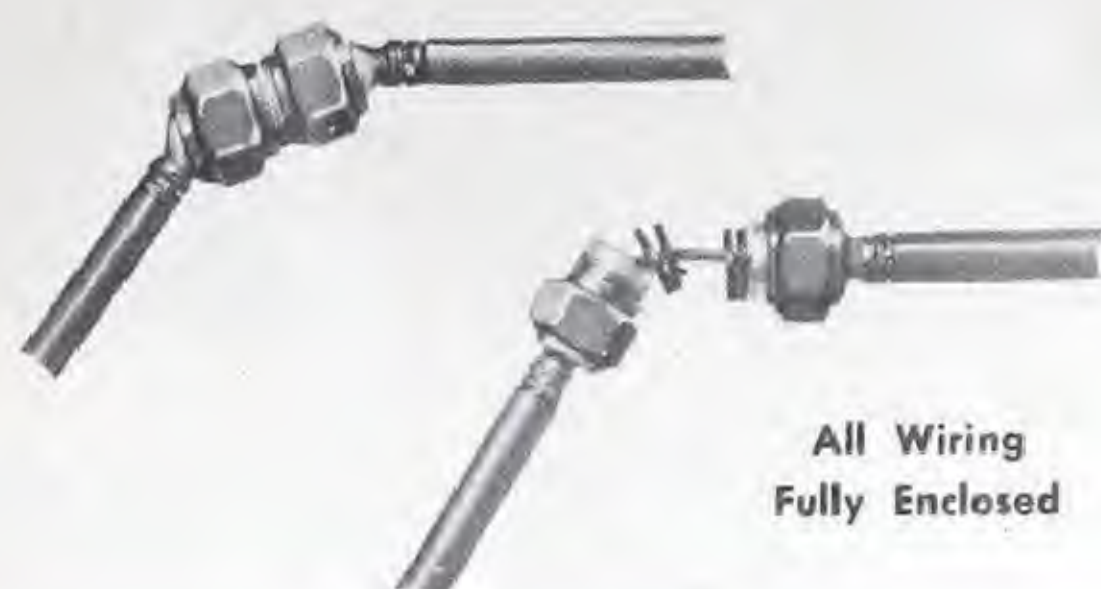
IMPROVED  
EMPLOYEE  
MORAL





## ENCLOSED JOINT TYPE FLEXIBLE ARM MODELS

C.S.A. APPROVED



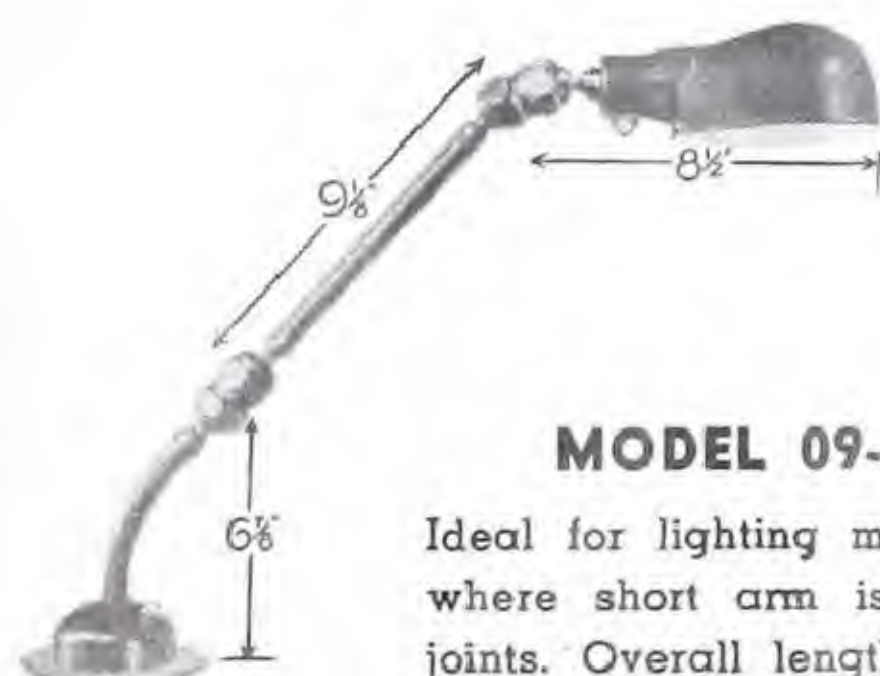
All Wiring  
Fully Enclosed

### GENERAL SPECIFICATIONS

Instantly adjustable arms with new type Adjusta-tension joints with tension adjustable to suit the job and the worker. All wiring fully enclosed. Reflectors are as listed on individual model specifications. Keyless porcelain lamp socket. Base mounts on 4" round or octagonal outlet box or on any flat surface. Toggle switch in base. Vista green color, matte finish baked enamel, infra-red baked. Units supplied completely wired and short leads for connection at outlet box.

### "HX" TYPE REFLECTOR GROUP

Reflector depth 3", orifice 5"x3 7/8". Reflector rotates 360°. Light distribution — medium asymmetric. Interior finish — high temperature, highly reflective white baked enamel. Accommodates all medium screw base lamps from 15 watts through 100 watt A-21.

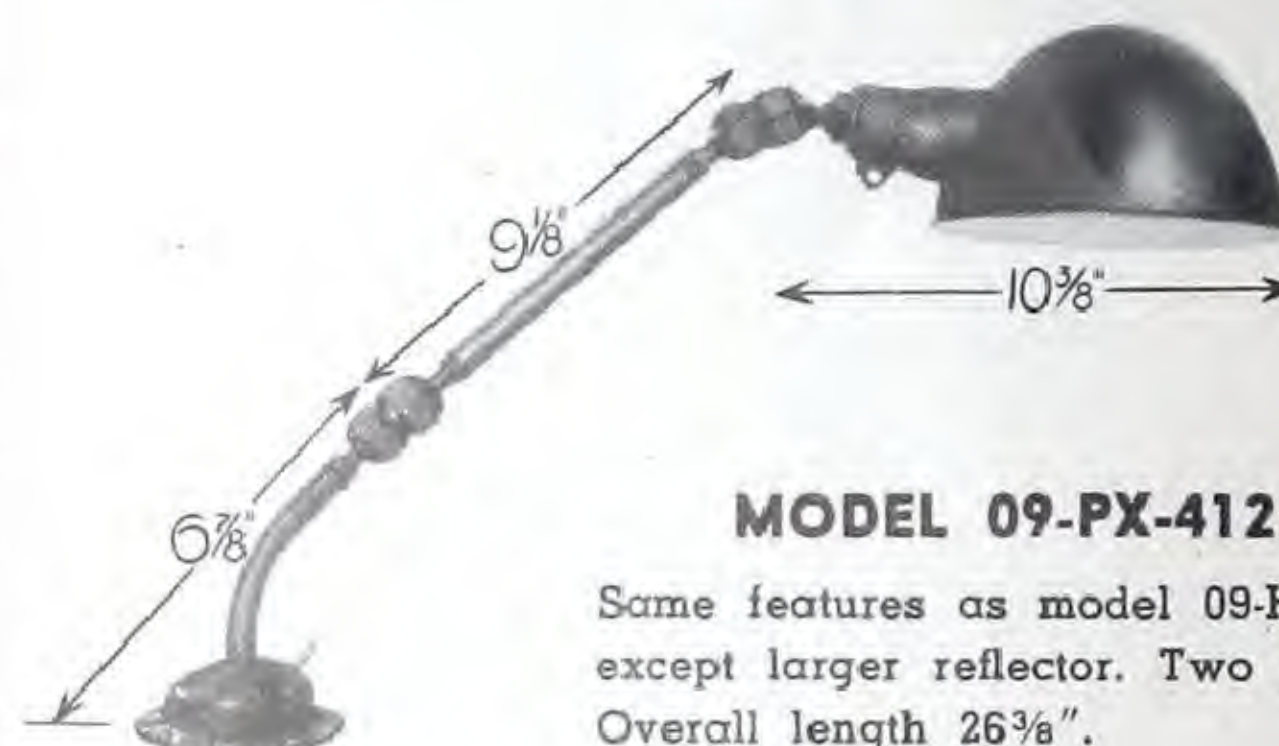


#### MODEL 09-HX-412

Ideal for lighting many operations where short arm is desired. Two joints. Overall length 24 1/2".

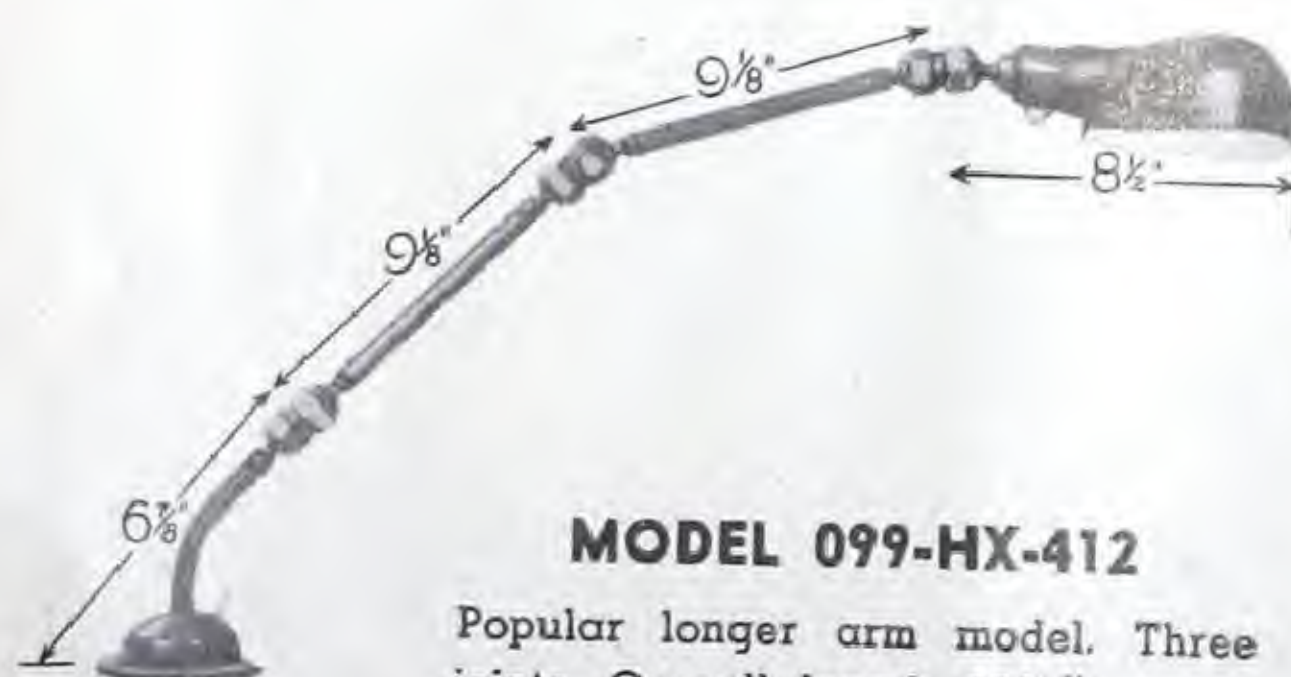
### "PX" TYPE REFLECTOR GROUP

Reflector depth 4 1/4", orifice diameter 6-9/16". Light distribution — wide. Interior finish — high temperature, highly reflective white. Accommodates all medium screw base lamps from 15 watts through 100 watt A-21.



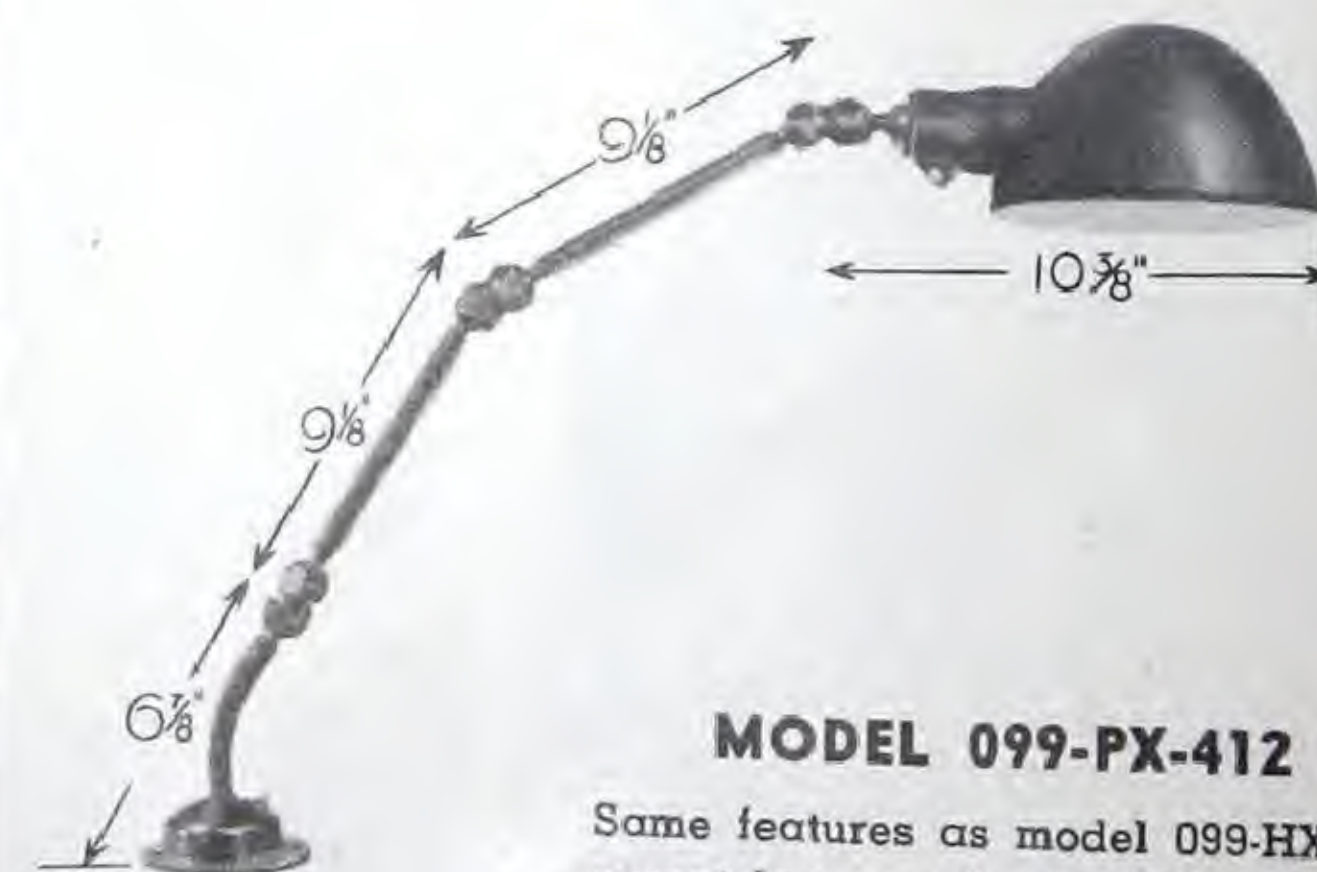
#### MODEL 09-PX-412

Same features as model 09-HX-412 except larger reflector. Two joints. Overall length 26 3/8".



#### MODEL 099-HX-412

Popular longer arm model. Three joints. Overall length 33 5/8".



#### MODEL 099-PX-412

Same features as model 099-HX-412 except larger reflector. Three joints. Overall length 35 1/2".



## FLEXIBLE TUBE ARM MODELS

C.S.A. APPROVED



All  
Wiring  
Fully  
Enclosed

### GENERAL SPECIFICATIONS

Strong flexible tubing arm, instantly adjustable to any position. All wiring fully enclosed. Reflectors are as listed on individual model specifications. Porcelain lamp socket. Base mounts on 4" round or octagonal outlet box or on any flat surface. Toggle switch in base. Vista green color, matte finish baked enamel, infra-red baked. Units supplied completely wired and short leads for connection at outlet box.

### "HX" TYPE REFLECTOR GROUP

Reflector depth 3", orifice 5"x3 7/8". Reflector rotates 360°. Light distribution — medium asymmetric. Interior finish — high temperature, highly reflective white baked enamel. Accommodates all medium screw base lamps from 15 watts through 100 watt A-21.



**MODEL 12-HX-400**

For small machine tools, etc., requiring short arm. Overall length 20 1/2".

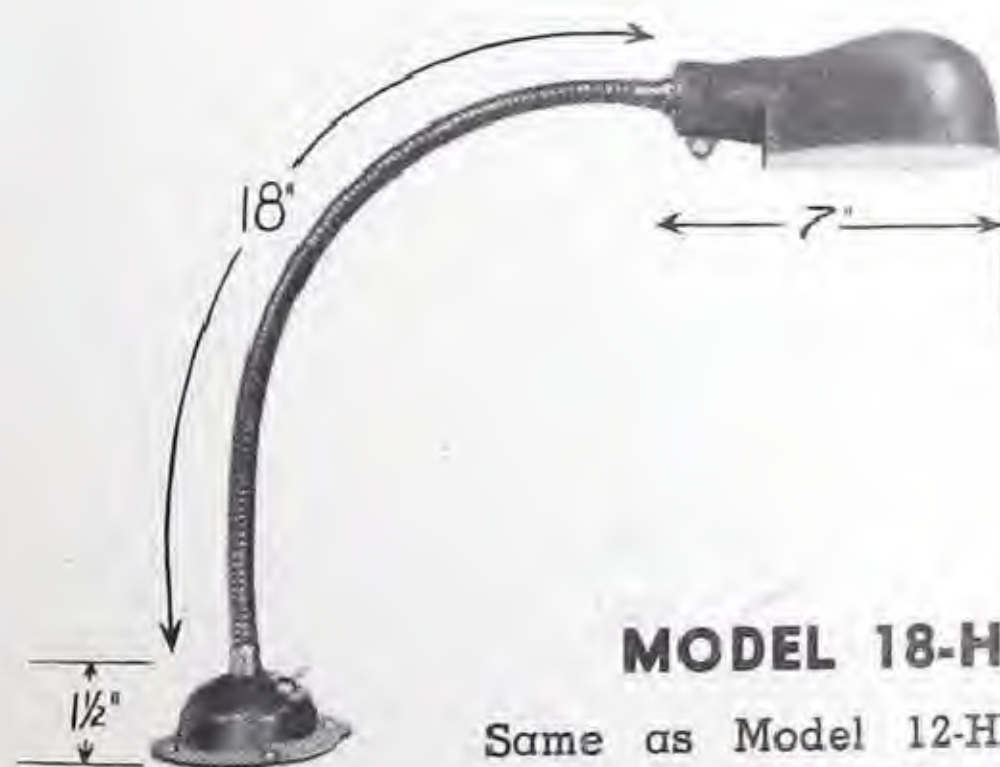
### "PX" TYPE REFLECTOR GROUP

Reflector depth 4 1/4", orifice diameter 6-9/16". Light distribution — wide. Interior finish — high temperature, highly reflective white. Accommodates all medium screw base lamps from 15 watts through 100 watt A-21.



**MODEL 12-PX-400**

Same as model 12-HX-400 except larger reflector. Overall length 22 1/2".



**MODEL 18-HX-400**

Same as Model 12-HX-400 except longer arm. Overall length 26 1/2".



**MODEL 18-PX-400**

Same as model 12-PX-400 except longer arm. Overall length 28 1/2".



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# Northern Electric

COMPANY LIMITED

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FORT WILLIAM WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA



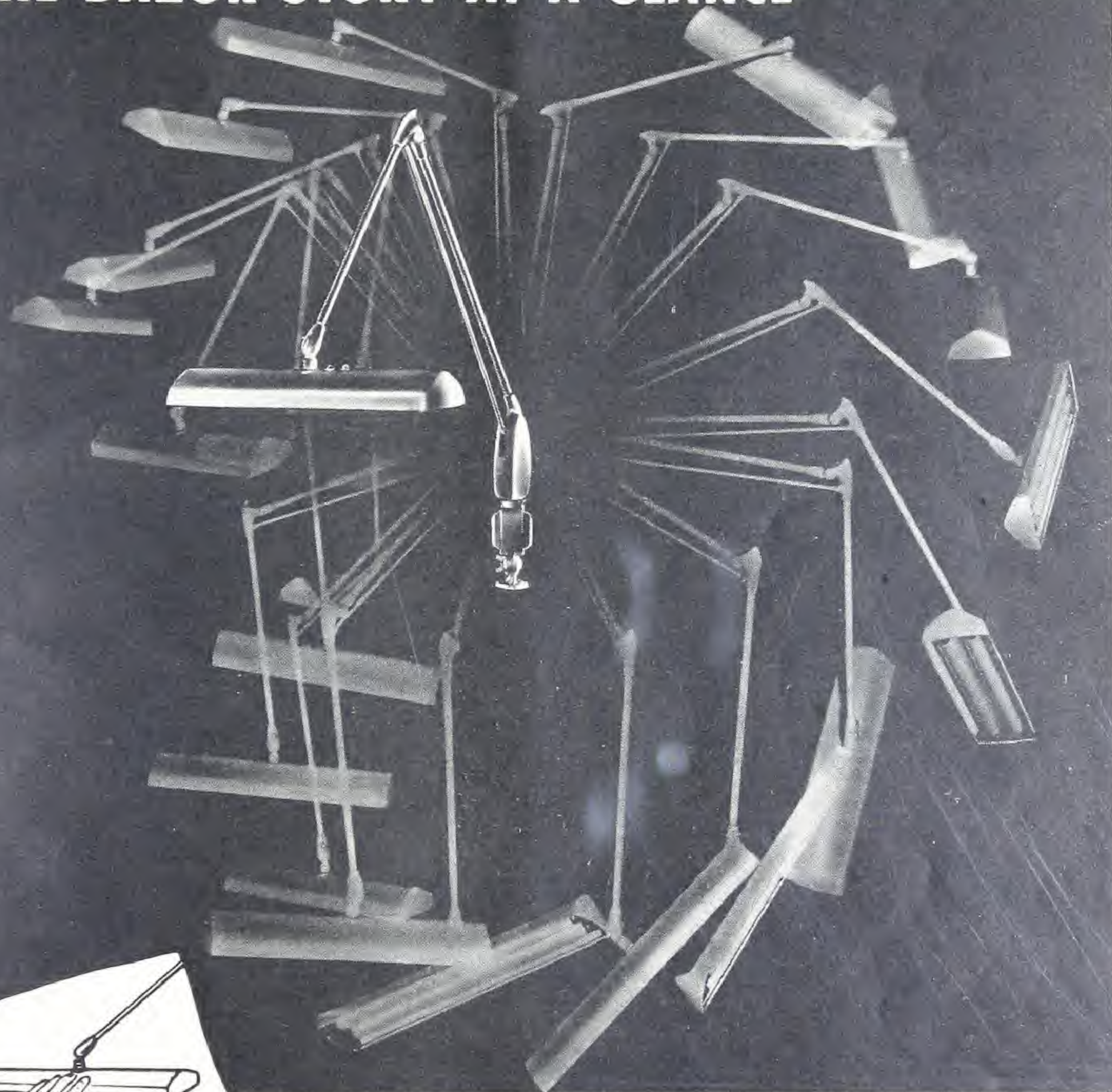
April, 1946 L-3-8

NOR-ELECTRIC



BULLETIN

## THE DAZOR STORY AT A GLANCE



CONTROLLED BY A TOUCH

## DAZOR FLOATING LAMPS

Float your light exactly where you want it . . . as quickly and easily as you move your arm. The Dazor Floating Lamp stays put without further adjustment or locking. Raise, lower, push or pull it; swing it through an arc; twist or turn it at an angle—wherever you stop the reflector it "stays put" until you change the position. The Dazor floating principle is entirely different from that of any other lamp, providing true finger-tip control for maximum convenience. It is the answer to efficient localized lighting—either fluorescent or incandescent.



## HOW THE DAZOR LAMP GETS ITS

# Flexibility



**Floating Arm:** A strong spring force, acting through a shifting fulcrum and parallelogram on both sections of the double-arm, equalizes the varying forces exerted by the arm, thereby balancing the arm in any position. This is a patented feature found only in Dazor Floating Lamps. The spring mechanism is entirely enclosed within a housing near the base.



**6-Swivel Combination:** Six different connections on a Dazor Floating Lamp respond to fingertip control, together permitting any angular adjustment.

At (1) the main standard swings  $305^\circ$  laterally.

At (2) the arm moves through a vertical arc of  $135^\circ$ .

At (3) the elbow of the arm encloses an arc of  $120^\circ$ .

At (4) the reflector assembly rotates  $360^\circ$  around the arm.

At (5) the reflector assembly moves  $185^\circ$  in the knob of the arm.

At (6) the reflector pivots  $305^\circ$  around the socket.

The floating arm principle, coupled with the double-arm construction and the six swivel and hinge joints described above, results in extreme flexibility and ease of manipulation without further tightening or locking.



## WHICH KIND OF LIGHTING ... Fluorescent or Incandescent?

The requirements of the individual task or machine, the state of general lighting, the user's preference—all of these help determine whether fluorescent or incandescent lighting will be best in a given installation. A few principles, however, can be stated.

Fluorescent Lamps have quickly become popular because they provide a cool diffused light; the result is clear, pleasing illumination without eye-strain. Fluorescent tubes consume less current per footcandle of illumination.

Incandescent Lamps are especially suitable for concentrated lighting of a limited area or for close inspection.

Each type is giving complete satisfaction in thousands of applications. Remember that the Dazor floating arm permits the reflectors of both Fluorescent and Incandescent Models to be placed wherever the user desires, giving accurate control over (1) intensity and (2) glare—the two most important factors in any lighting system.



Two typical Dazor Floating Lamp installations:

At left, Dazor Incandescent Universal Model, attached to machine tool.

At right, Dazor Fluorescent Bracket Model, attached to drafting board.



## CORRECT LOCALIZED LIGHTING Increases Production Efficiency

The Dazor Floating Lamp carries localized lighting to its logical conclusion. The user gets light where needed. And a touch of the hand adjusts that light in such a way as to avoid reflected glare; the rays are directed away from and not into the eyes of the worker. Thus a major cause of eye-strain, fatigue, errors and accidents is checked at the source. Employees profit by increased efficiency, better health, higher morale.

By its contribution to the productive capacity of both men and machines, correct lighting promotes industrial efficiency. Electric light and power go into the planning, manufacture and use of every type of product. In industry, factory and office, hundreds of thousands of Dazors are helping to save time and increase output.



# STANDARD BASE MODELS

The Dazor Floating Lamp provides a choice of four bases, suitable for virtually any application on machine-tools, benches, walls, drawing boards, desks or floors.

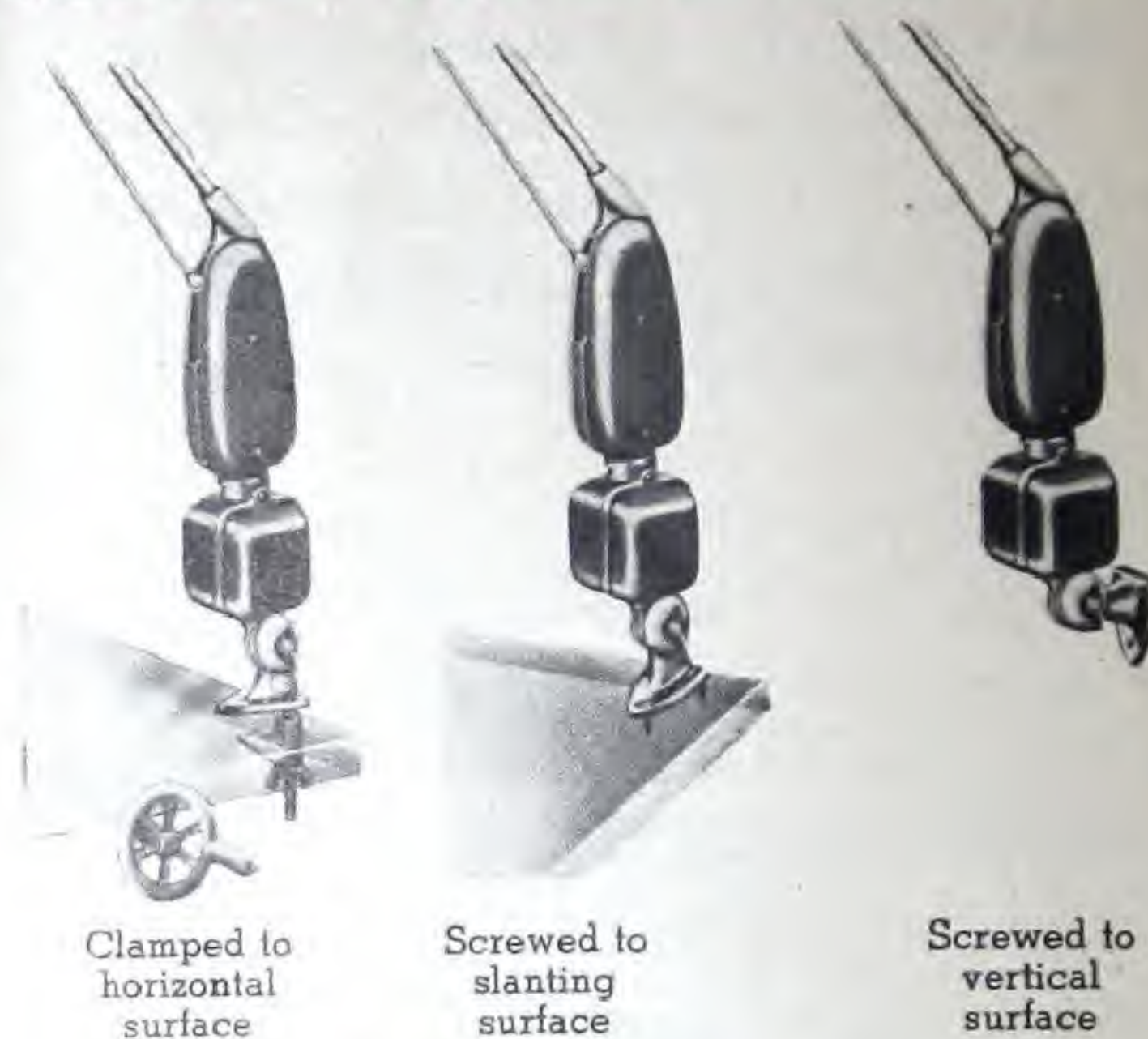
**Universal Model:** With this combination base the lamp may be clamped or screwed to any surface—horizontal, sloping or vertical. The base is provided with three holes for mounting with screws; when thus screwed in place, the stud, clamping lug and wing nut are not used. A base pad, to prevent the scarring of fine surfaces, and wood screws for mounting are furnished with each unit. See typical mountings at right.

**Pedestal Model:** A heavy iron base, 12" in diameter, gives stability to this portable floor-type Dazor. Pedestal measures 39" from floor to arm-hinge at top of pedestal. This model is especially adapted to offices, doctors' quarters and homes.

**Desk Model:** The weighted base of this Dazor Lamp does not require fastening down, permitting it to be placed anywhere on a flat-top desk, table or other horizontal surface; can be moved as desired. Base is streamlined as shown.

**Bracket Model:** A goose-neck iron bracket forms the base of this Dazor model. Fastened to under side of drawing board by screws, it leaves upper edge of board clear for T-square, instruments or rolled cover.

**Note.** After mounting lamp, the standard that supports the arm should be adjusted to a vertical position; otherwise arm tends to rotate to low point of arc.



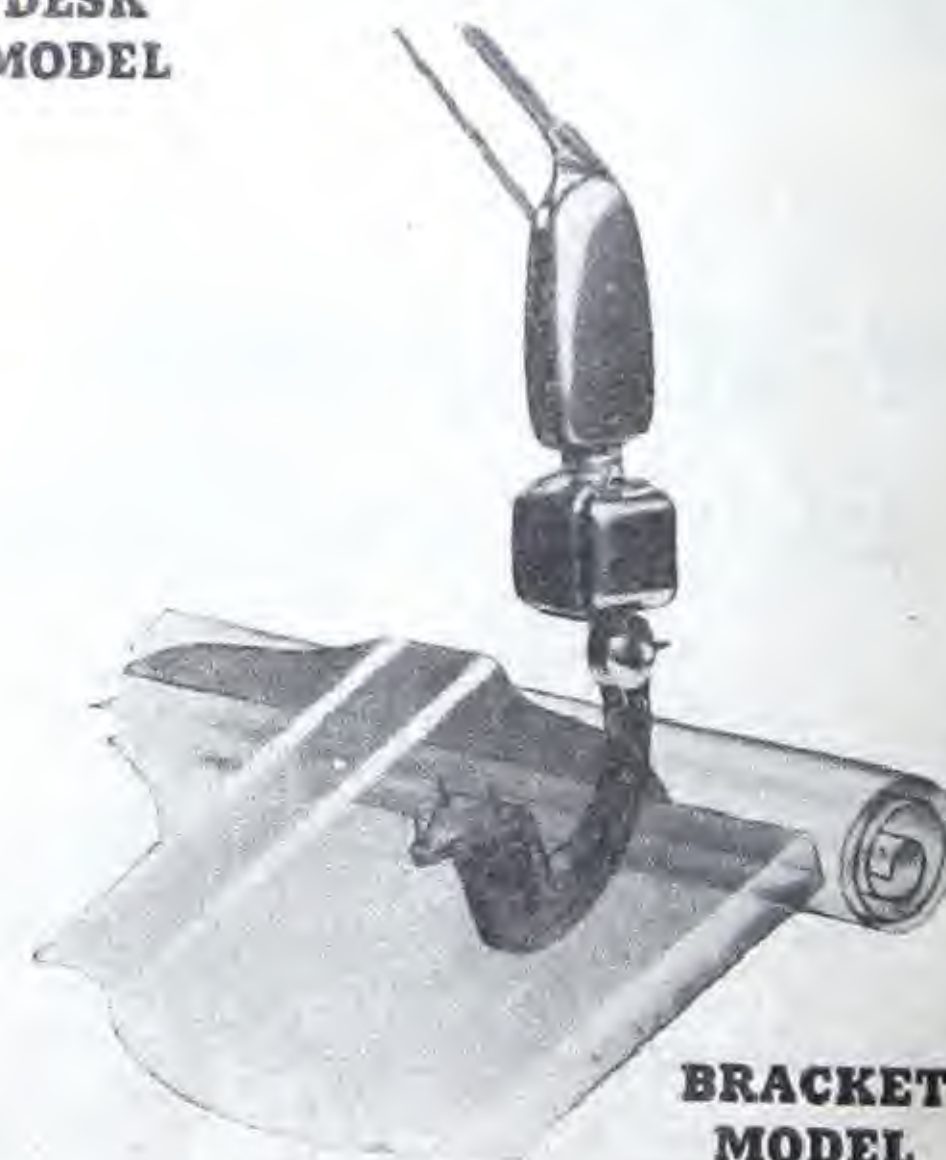
UNIVERSAL MODEL



DESK MODEL



PEDESTAL MODEL



BRACKET MODEL

## STANDARD FINISH

The standard Dazor finish is Statuary Bronze Baked Enamel. Inner surfaces of reflectors are white Baked Enamel. The Pedestal Model,

either Fluorescent or Incandescent, may also be obtained with outside finish in White Baked Enamel.



## Dazor Floating Arm FLUORESCENT LAMPS



FOR 15-WATT LAMPS



FOR 6-WATT LAMPS

**Dazor Ballasts:** In Universal and Bracket Models the ballasts are installed in the rectangular housing just above the base; in Pedestal and Desk Models they are in the lamp base.

**Dazor Manual Fluorescent Starter:** This is a combination line switch and manual starter built into a single unit. A patented Dazor development, it incorporates the following salient features:

1. Positive action, efficient and durable.
2. No periodic replacements required.
3. Starts fluorescent tubes on a line voltage as low as that on which the tubes themselves will operate.

4. Eliminates blinking of de-activated tubes; upon lamp failure no current flows through the ballast, as the cathode heating circuit is always open (except when the red starter button is depressed for starting the tube), thus preventing wastage and overheating of the ballast.
5. The Dazor Manual Fluorescent Starter will function and start a tube at any temperature at which the tube itself will function.

**Power Factor Corrected Fluorescent Lamps:** All fluorescent units listed have a capacitor in the ballast circuit which raises the power factor above 90%.

## Dazor Floating Arm FLUORESCENT LAMPS

### DESK MODEL

Using Two 15-WATT Lamps

Catalogue Number	Circuit Voltage	Power Factor	Arm Extension
P-2324-16	110V—60C	95%	24"

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base, and a No. 7701 Rubber Cap.

The Fluorescent Desk Model is portable, requiring no screws or clamps; base is weighted to support the floating arm in any position while resting on any level desk, table or stand. Convenient for flat-top desks of executives, architects, accountants, clerks. For slanting surfaces, such as drawing boards, specify the Universal or Bracket Model. Auxiliary is installed in the base.

### Dazor Rigid Arm UNIVERSAL MODEL

Using Two 6-WATT Lamps

Catalogue Number	Circuit Voltage	Power Factor	Arm Extension
P110B206W16	110V—60C	95%	10"
P114B206W16	110V—60C	95%	14"
P118B206W16	110V—60C	95%	18"

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base, and a No. 7701 Rubber Cap.

This Special Fluorescent Universal Model, with Rigid Arm instead of Floating Arm, has been newly designed and introduced in response to repeated requests. It meets a frequent need by fitting in close quarters that may not take a full-size mounting, at the same time lighting a small fixed area brightly. Light source can be controlled laterally and at the reflector, lacking only the extensibility of the standard double arm. Curved arm is 1/2" cold rolled steel tubing. Other measurements are as follows: Vertical rise from clamp base, 14". Horizontal extension, 10", 14" or 18", as ordered. Height of reflector above base plane, 10 3/4". Auxiliary is installed in housing just above the base.



## Dazor Floating Arm FLUORESCENT LAMPS

### UNIVERSAL MODEL

Using Two 15-WATT Lamps

Catalogue Number	Circuit Voltage	Power Factor	Arm Extension
P-2124-16	110V—60C	95%	24"
P-2134-16	110V—60C	95%	34"

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base, and a No. 7701 Rubber Cap.

The Fluorescent Universal Model fastens to practically all types of factory or machine shop equipment: lathes, drills, presses, shapers, milling machines, assembly benches, inspection tables. To work benches in garages . . . to repair benches in jewellery, engraving, radio, typewriter and bicycle shops . . . to tables or walls in dental, medical and chemical laboratories . . . to drawing boards . . . to business machines, desks, tables and files in offices . . . to desks and work benches in private homes, basements and garages. The 24" arm extension is recommended for average-size benches, machines, desks and stands; the 34" for drawing boards, executive desks and large working areas. Auxiliary is installed in housing beneath the spring mechanism.

### UNIVERSAL MODEL

Using Two 6-WATT Lamps

Catalogue Number	Circuit Voltage	Power Factor	Arm Extension
P-6W-2124-16	110V—60C	95%	24"
P-6W-2134-16	110V—60C	95%	34"

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base, and a No. 7701 Rubber Cap.

This is identical with the standard Floating Arm Universal Model, except that the reflector is but 9 $\frac{3}{4}$ " long. It duplicates the larger lamp in flexibility and service. Can be clamped or screwed anywhere that the other can—on numerous types of machines, benches and desks. Where space is at a premium, or when high lighting efficiency is required in small compass, this model usually solves the problem easily. Choice of 24" or 34" arm extension. Auxiliary is installed in housing beneath the spring mechanism.

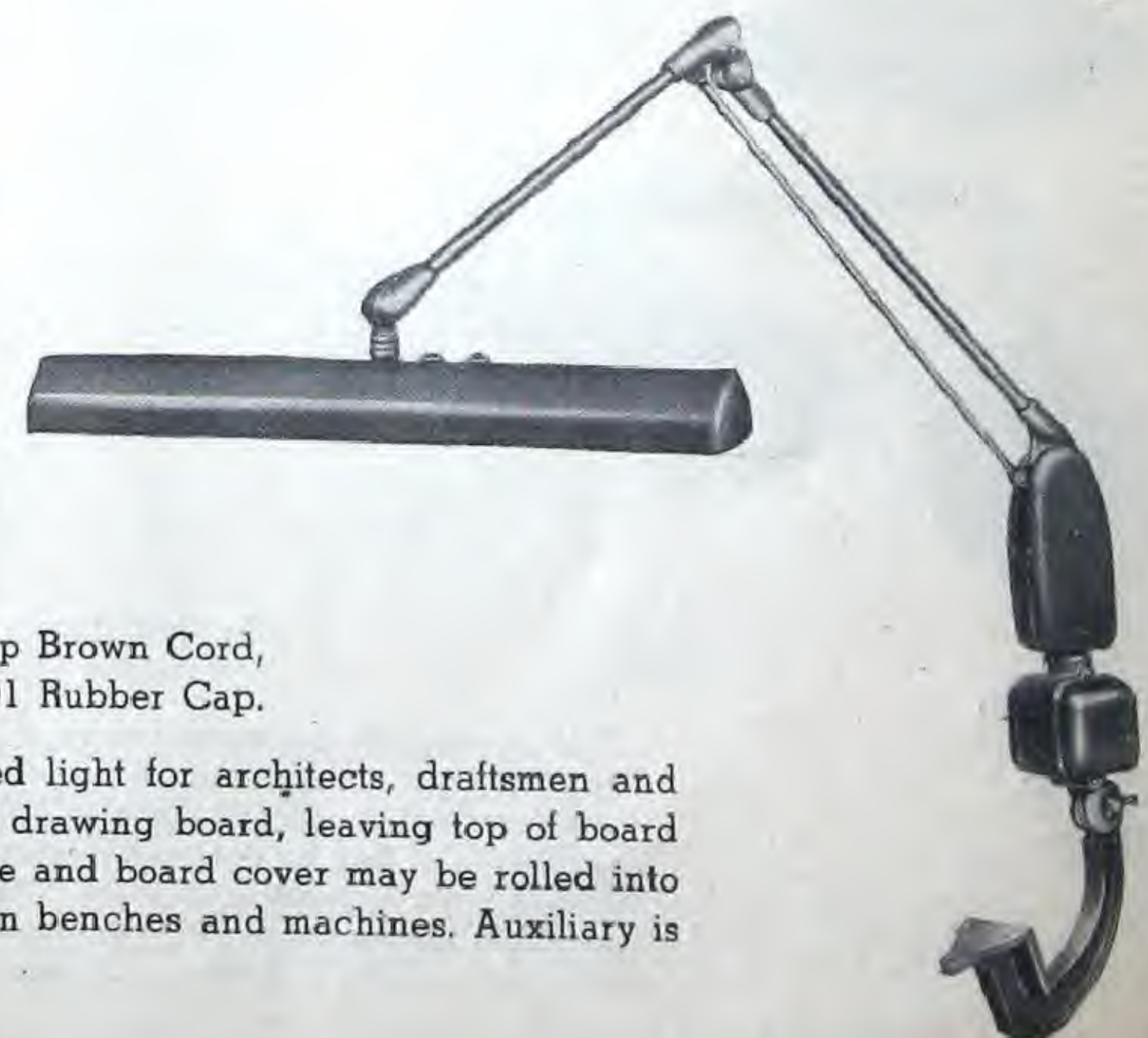
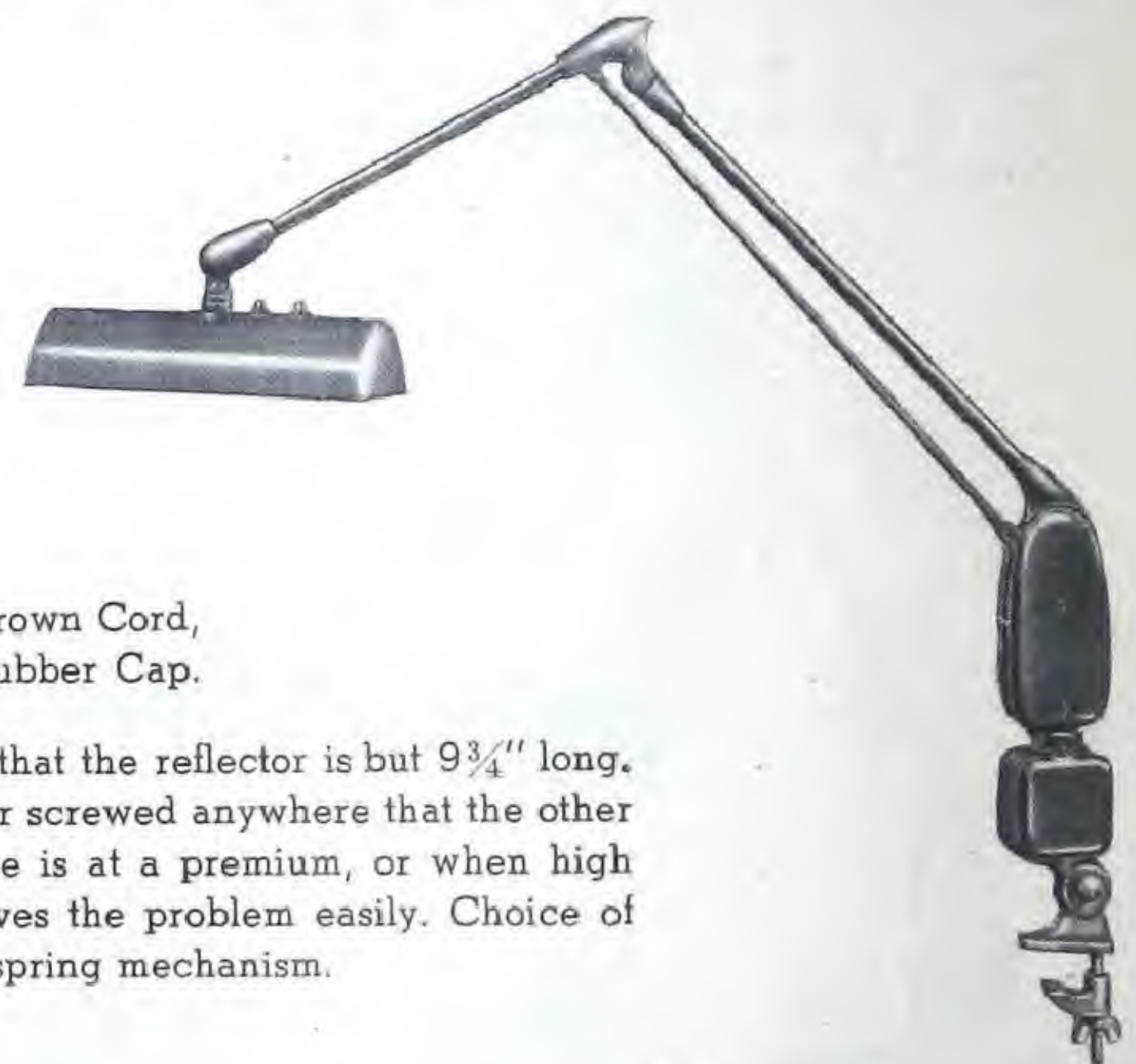
### BRACKET MODEL

Using Two 15-WATT Lamps

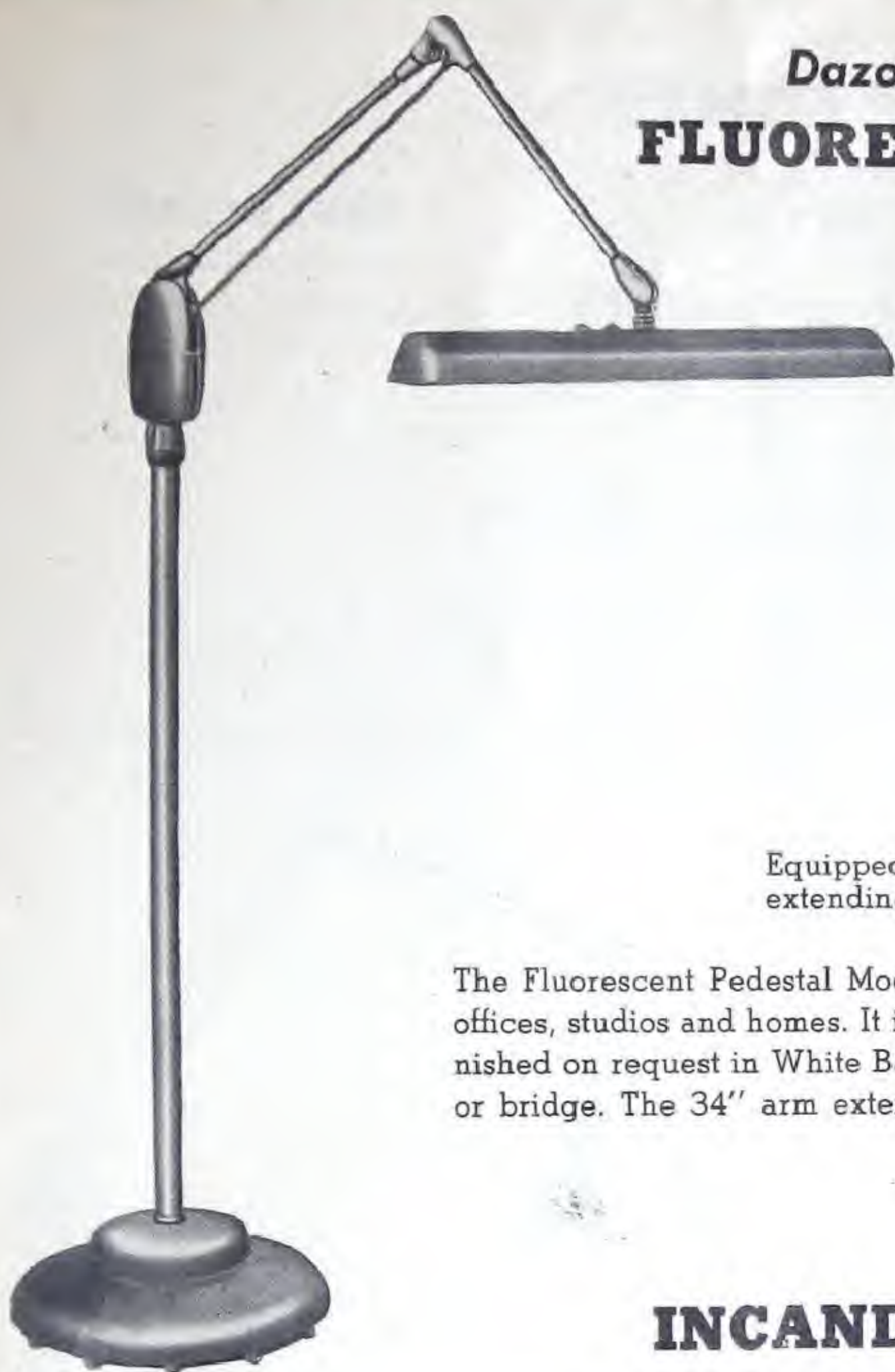
Catalogue Number	Circuit Voltage	Power Factor	Arm Extension
P-2434-16	110V—60C	95%	34"

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base, and a No. 7701 Rubber Cap.

The Fluorescent Bracket Model provides convenient, easily directed light for architects, draftsmen and artists. The goose-neck base attaches with screws to under side of drawing board, leaving top of board entirely free of obstruction. T-square may be used along upper edge and board cover may be rolled into hollow of the goose-neck fitting. This base is also adaptable to certain benches and machines. Auxiliary is installed in housing beneath the spring mechanism.







## Dazor Floating Arm FLUORESCENT LAMPS

### PEDESTAL MODEL

Using Two 15-WATT Lamps

Catalogue Number	Circuit Voltage	Power Factor	Arm Extension
P-2224-16	110V-60C	95%	24"
P-2234-16	110V-60C	95%	34"

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base, and a No. 7701 Rubber Cap.

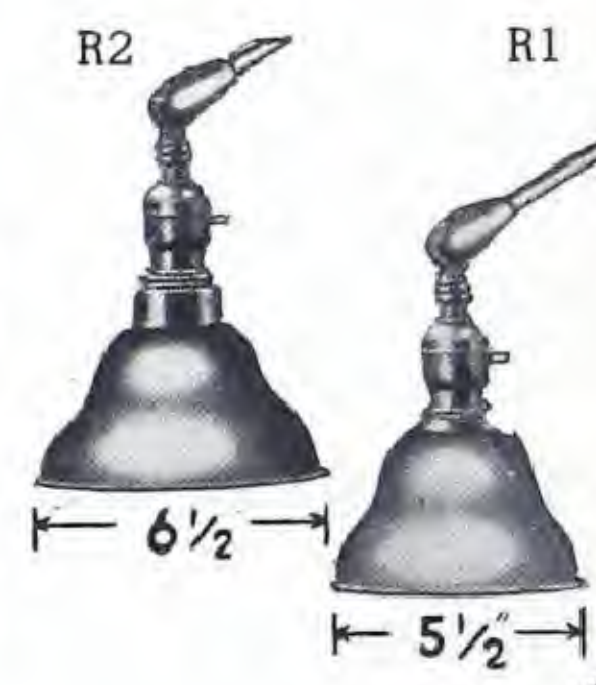
The Fluorescent Pedestal Model is an all-purpose floor lamp, especially suitable for shops, physicians' offices, studios and homes. It is handy in the sick-room for nurses' use, or as a patient's night lamp. Furnished on request in White Baked Enamel Finish. Use the Pedestal Lamp in the home for reading, sewing or bridge. The 34" arm extension is favoured for most applications. Auxiliary is installed in the base.

## INCANDESCENT LAMPS

**Lamp Holders:** These are high grade, brass shell, medium base, push-thru type with threaded shell to receive threaded reflectors.

**Reflectors:** Three styles are offered—types "S", "R1" and "R2". The "S" reflector is assembled with the lamp arm and is included in the catalogue number. The "R1" reflector may be used with a 25 or 40 watt lamp and the "R2" reflector with a 40 or 60 watt lamp. These reflectors are not assembled with the arms and must be ordered separately.

**Caution:** Dazor Floating Lamps are adjusted at the factory to balance Dazor Reflectors; we caution against the use of others, as any appreciable difference in weight will result in throwing the floating arm out of its normal and automatic state of balance.



## Dazor Floating Arm INCANDESCENT LAMPS and Reflectors

with "S" Reflector included  
For One 40 Watt to 60 Watt Bulb

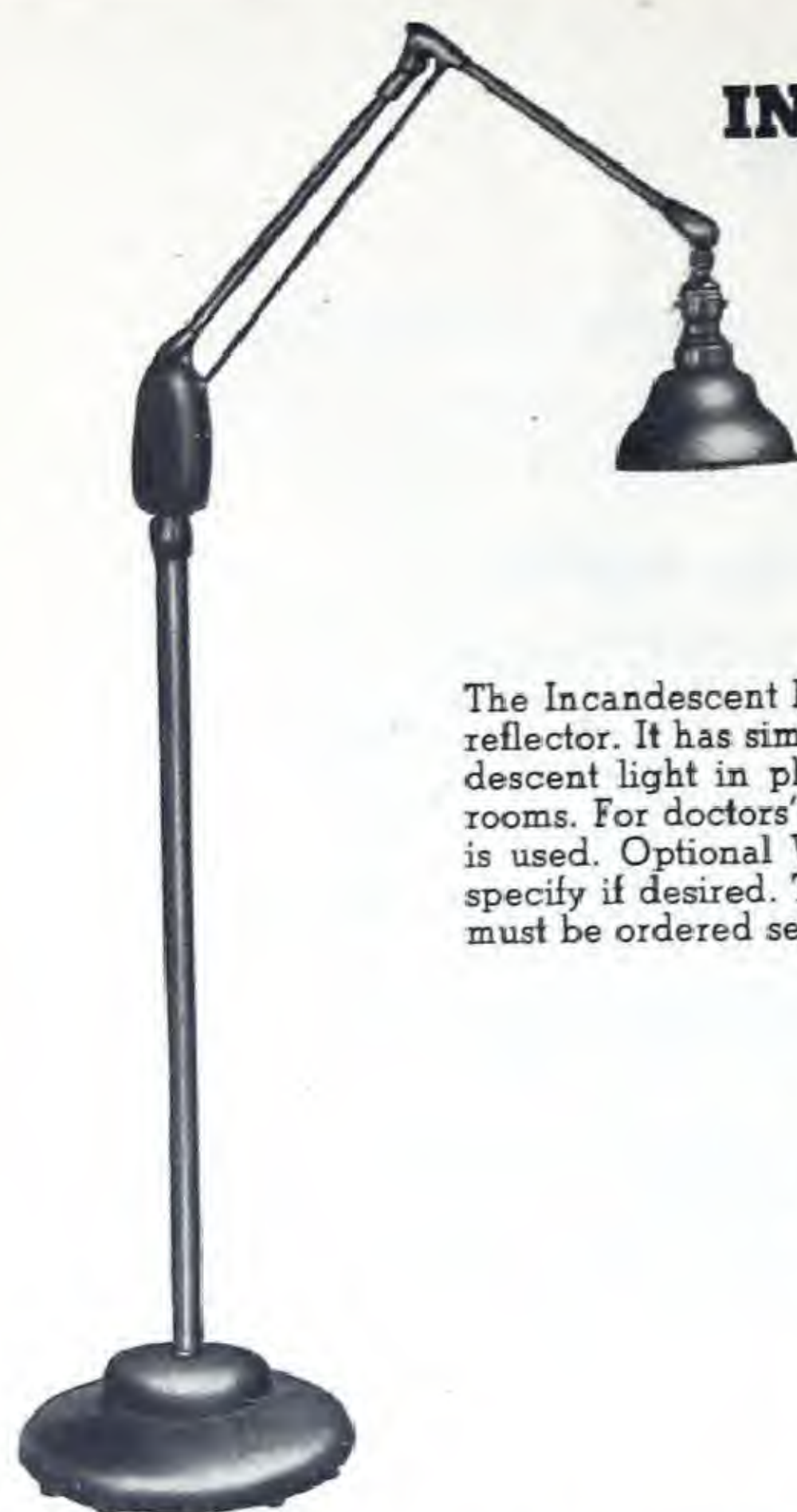
Type of Base	Catalogue Number	Arm Extension
Desk Model	3324-S	24"
Universal Model	3124-S	24"
Universal Model	3134-S	34"
Bracket Model	3434-S	34"



Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base, and a No. 7701 Rubber Cap.

This attractive incandescent lamp model with rectangular reflector serves many applications.





## Dazor Floating Arm INCANDESCENT LAMPS

### PEDESTAL MODEL

Catalogue Number	Height of Pedestal	Arm Extension
3224	39"	24"
3234	39"	34"

### REFLECTORS

Catalogue Number	Diameter
R-1	5½"
R-2	6½"

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base, and a No. 7701 Rubber Cap.

The Incandescent Pedestal Model matches the Fluorescent Model differing only in kind of light source and reflector. It has similar home, office and shop uses. Special attention is called to the value of portable incandescent light in physicians' offices—for consultation, examination and minor operations—and in patients' rooms. For doctors' use, a R-40IF 150-watt Bulb is recommended. A reflector is not required when this bulb is used. Optional White Baked Enamel Finish, available in this model, harmonizes with other equipment; specify if desired. The 34" arm extension is favoured. These reflectors are not assembled with the arms and must be ordered separately.

### BRACKET MODEL

Catalogue Number	Extension
3434	34"

### REFLECTORS

Catalogue Number	Diameter
R-1	5½"
R-2	6½"

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 7'10½" from the base, and a No. 7701 Rubber Cap.

The Incandescent Bracket Model and its duplicate with fluorescent illumination, give the architect, draftsman or artist the lighting of his choice, plus freedom from interference with drawing instruments anywhere on the board's surface. Goose-neck bracket is quickly attached to under side of board with three screws. When angle of board is changed, lamp standard should be adjusted to retain its vertical position. This model may also be permanently attached to various machines, benches and tables. These reflectors are not assembled with the arms and must be ordered separately.

### UNIVERSAL MODEL

Catalogue Number	Arm Extension
3124	24"
3134	34"

### REFLECTORS

Catalogue Number	Diameter
R-1	5½"
R-2	6½"

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base for the 24" Arm, and 7'10" for the 34" Arm; and a No. 7701 Rubber Cap.

The Incandescent Universal Model has the same broad applications as outlined for the corresponding fluorescent Model. It is serving machinists, die and tool makers, assemblers, inspectors, mechanics, repairmen. It is popular with architects, engineers, draftsmen, artists, chemists, amateur and professional photographers. It has many uses in connection with adding machines, mimeograph machines, and similar equipment, and in homes. The 24" arm extension is recommended for average-size benches, machines, desks and stands; the 34" for drawing boards, executive desks and large working areas. These reflectors are not assembled with the arms and must be ordered separately.



# Northern Electric

COMPANY LIMITED

HALIFAX SAINT JOHN, N.B. QUÉBEC TROIS RIVIÈRES SHERBROOKE MONTREAL OTTAWA VAL D'OR  
TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY PORT ARTHUR  
WINNIPEG REGINA CALGARY EDMONTON VERNON VANCOUVER VICTORIA



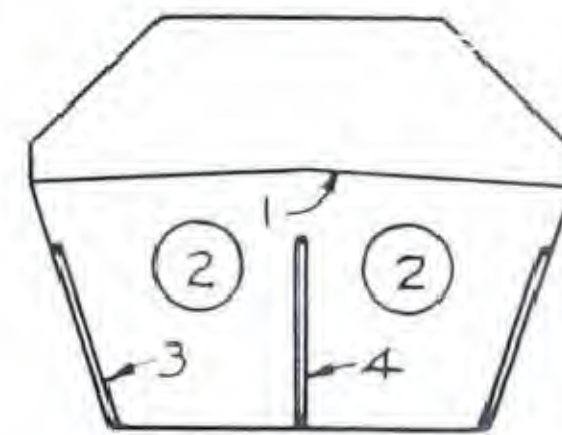


# NEW TRANQUILUX

CANADIAN PATENT  
No. 405912



1. FLURACITE REFLECTOR
2. FLUORESCENT LAMPS  
(Not supplied)
3. DIFFUSING LAMP SHIELD
4. LIGHT MIXING SHIELD



## FLUORESCENT LUMINAIRE

FINISHED IN WHITE

Refreshingly cool and good looking

SMOOTH - COOL - DAYLIGHT

The two lamps operate out-of-step, with one lamp at maximum brilliance when the other is at its minimum. The mixing panel of Tranquilux neutralizes the light from both lamps, giving smooth even illumination.

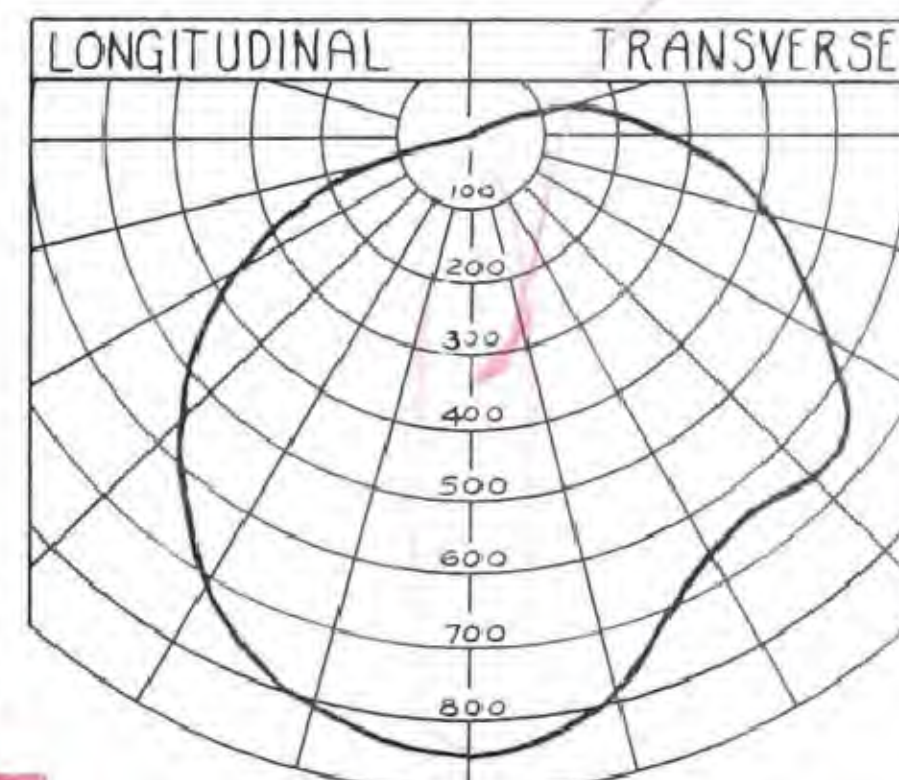
**Note:** For best results on 25-cycle circuits, use lamps with coated ends. Where three-phase power is available, connect adjacent units to alternate phases.

### SHIELDED LAMPS—WITH EFFICIENCY

The lamps are well shielded from any normal transverse viewing angle. The planes of the reflector and shield are selected to minimize dust collection, thereby maintaining initial efficiency.

### EFFICIENCY

0°- 90°	65.80%
90°-180°	5.20%
0°-180°	71.0%



### HOW TO MAKE CONTINUOUS RUNS

Remove ornaments and bolts from end plates to be joined. Couple end plates together with chase nipple and locknut and replace bolts.

### FLURACITE REFLECTING SURFACE

Fluracite on steel. This reflecting surface is a synthetic material, glossy white and mineral-hard, discovered by Curtis after extensive research—especially developed to maintain, and not distort, the color value of the fluorescent lamp. Fluracite possesses unusually high reflectivity and is easily cleaned with soap and water.

Number of 40-Watt Lamps	DIMENSIONS		CATALOG NUMBERS	
	Height	Width	60-Cycle	25-Cycle
Two.....	7"	9"	6227-C	6227-F
Three.....	7"	12¼"	6237-C	Not available
Four.....	7"	16"	6247-C	6247-F

Hangers not included—see page 4.



# PLANNING WITH TRANQUILUX FOOTCANDLE CHARTS

Footcandles for Tranquilux may be calculated from the charts or by the "Coefficient of Utilization" method, using the table directly below.

COEFFICIENTS OF UTILIZATION									
CEILING	75%			50%			30%		
WALLS	50%	30%	10%	50%	30%	10%	30%	10%	
ROOM INDEX	COEFFICIENTS OF UTILIZATION								
J	.29	.25	.22	.29	.25	.22	.24	.22	
I	.37	.32	.30	.36	.32	.29	.32	.29	
H	.40	.36	.34	.39	.36	.34	.35	.33	
G	.44	.40	.37	.42	.39	.37	.38	.36	
F	.47	.43	.40	.45	.42	.39	.41	.39	
E	.51	.47	.44	.49	.46	.43	.45	.43	
D	.55	.51	.48	.53	.50	.47	.49	.47	
C	.57	.52	.49	.54	.51	.49	.51	.48	
B	.60	.56	.53	.57	.54	.52	.53	.52	
A	.61	.58	.55	.59	.56	.54	.55	.53	

The application of continuous fluorescent sources to general lighting problems is somewhat different than planning for luminaires on conventional outlet spacing. For this reason the footcandle charts shown have been prepared.

Constant footcandle values are obtained under a continuous section at points more than 12 feet in from either end. At the end of a long section, the values are one-half of those under the center of a long section.

The chart shows how the intensities under single and continuous sections vary with mounting height. It is easy to determine the intensities between continuous sections by the use of the data given.

The charts have been compiled from tests on units mounted on a fairly light ceiling and are based on lamps of 2100 lumens, which is the present rated lumen output for 40-watt white lamps.

All values are for white lamps. For daylight lamps decrease values by 15 per cent.

A maintenance factor of 75 per cent is suggested. This means the footcandle values over a period of time will be 75 per cent of those given in the tables.

## APPROXIMATE FOOTCANDLE VALUES

For large interiors with average ceiling heights each watt (including ballasts), per square foot of floor area, will produce approximately 15 to 20 footcandles including a depreciation factor. For smaller rooms for each watt per square foot an average of 12 to 15 footcandles will result.

## FOOT-CANDLE READINGS ON HORIZONTAL PLANE

SINGLE TWO LAMP UNIT														
ALSO CONTINUOUS SECTION														
LAMP WATTAGE	READINGS ON CENTRE LINE PARALLEL TO LAMPS							READINGS ON CENTRE LINE RIGHT ANGLES TO LAMPS						
	1	2	3	5	11	18	20	16	9	5.5	3.5	3	2	
2-40	1	2	3	5	11	18	20	16	9	5.5	3.5	3	2	6'
CONT.							60	45	30	17	10	8	4	9'
2-40	2	3	3.5	5	7	9	10	9	6	5	3.5	2.5	2	12'
CONT.							40	36	24	21	14	8	6	
2-40	1	2	3.5	4	7	7	7	7	7	5	3	2	1	
CONT.							32	26	24	20	14	10	5	
	12'	10'	8'	6'	4'	2'	0'	2'	4'	6'	8'	10'	12'	

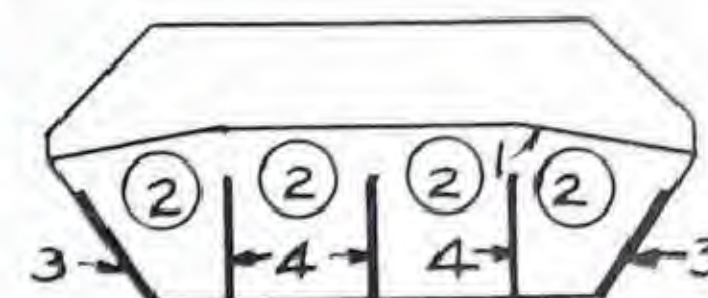
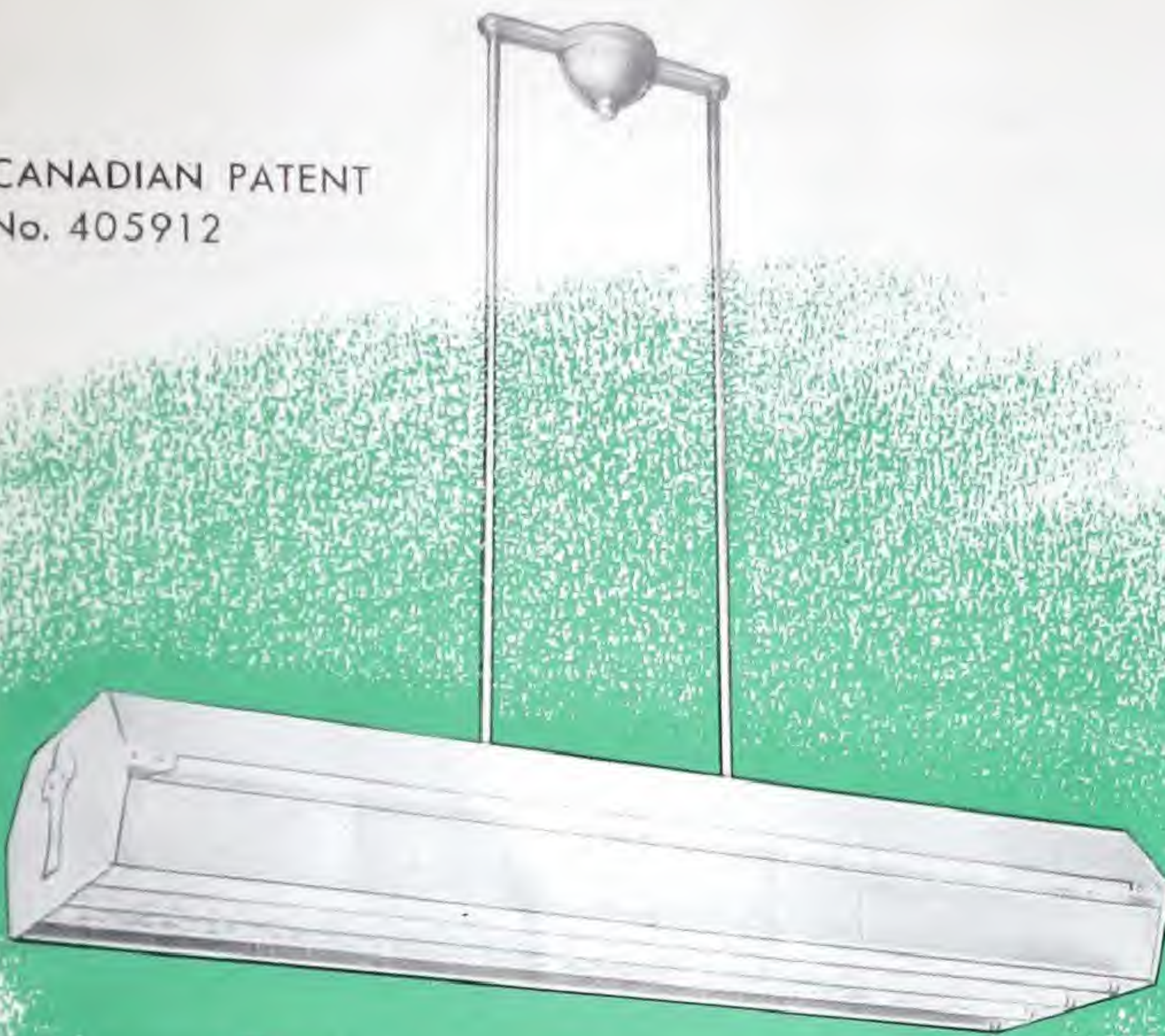
SINGLE THREE LAMP UNIT														
ALSO CONTINUOUS SECTION														
LAMP WATTAGE	READINGS ON CENTRE LINE PARALLEL TO LAMPS							READINGS ON CENTRE LINE RIGHT ANGLES TO LAMPS						
	1.5	2.5	4	7	15	26	30	24	13	10	5	3.5	2.5	
3-40	1.5	2.5	4	7	15	26	30	24	13	10	5	3.5	2.5	6'
CONT.							90	70	40	30	15	10	5	9'
3-40	2.5	4	5	7	10	13	15	13	9	7	6	3.5	3	12'
CONT.							60	50	36	28	18	10	8	
3-40	1.5	3	5	6	10	10	10	10	10	7	5	3	1.5	
CONT.							45	40	38	28	22	15	7	
	12'	10'	8'	6'	4'	2'	0'	2'	4'	6'	8'	10'	12'	

SINGLE FOUR LAMP UNIT														
ALSO CONTINUOUS SECTION														
LAMP WATTAGE	READINGS ON CENTRE LINE PARALLEL TO LAMPS							READINGS ON CENTRE LINE RIGHT ANGLES TO LAMPS						
	2	3	5	9	19	35	40	32	17	14	7	4	3	
4-40	2	3	5	9	19	35	40	32	17	14	7	4	3	6'
CONT.							120	94	54	42	21	11	6	9'
4-40	3	5	7	9	13	17	20	18	12.5	9.5	8	5	4	12'
CONT.							80	72	50	38	32	20	12	
4-40	2	4	7	8	13	13	13	13	13	9	7	4	2	
CONT.							58	50	40	35	30	20	10	
	12'	10'	8'	6'	4'	2'	0'	2'	4'	6'	8'	10'	12'	



CANADIAN PATENT  
No. 405912

# CURTIS TRANQUILUX FLUORESCENT LUMINAIRE



1. FLURACITE REFLECTOR
2. FLUORESCENT LAMPS  
(Not supplied)
3. DIFFUSING LAMP SHIELD
4. LIGHT MIXING SHIELD

**Smooth and tranquil light** with a minimum of flicker is assured with the new Tranquilux. The patented mixing panel, shape of reflector and other features make this new luminaire particularly good.

**Eye comfort lighting** is radiated by this well-shielded unit which increases the area of the light source and conceals the lamps from any normal transverse viewing angle.

**Graceful in design** and line in appearance, it blends into and enhances modern interiors.

**Efficient and effective light control.** The maximum output is directed toward horizontal surfaces with adequate emission toward vertical planes to

make the seeing task on slanted or vertical surfaces easy.

**Ease of maintenance** is assured by the placing of all reflecting and diffusing elements in planes which resist dust adhesion. All of these important surfaces are easy to clean and, being hard, they resist scratching or deterioration.

**Economical to install**, as all units can be mounted in continuous rows which lowers wiring costs. In many cases, individual four-lamp units on existing outlets will give adequate illumination without rewiring.

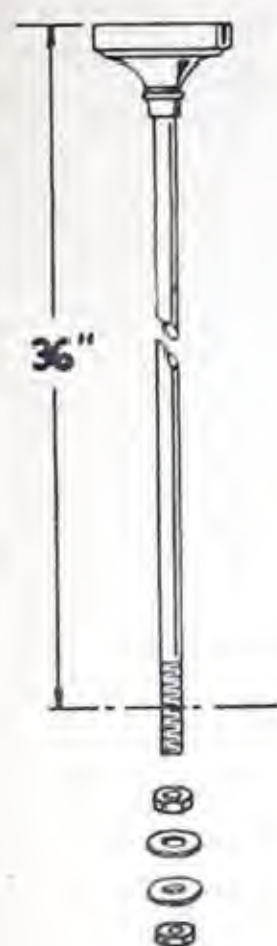
Number of 40-Watt Lamps	DIMENSIONS		CATALOG NUMBERS	
	Height	Width	60-Cycle	25-Cycle
Two	7"	9"	6227-C	6227-F
Three	7"	12 1/4"	6237-C	Not available
Four	7"	16"	6247-C	6247-F

Hangers not included—see page 4.



# HANGERS FOR SUSPENDING TRANQUILUX

For normal ceiling heights (11'6" and lower) mount Tranquilux units directly against ceiling. On higher ceilings, they may be suspended if desired. For good appearance and lighting results, the top of the housing should be from 10' to 11' above the floor.

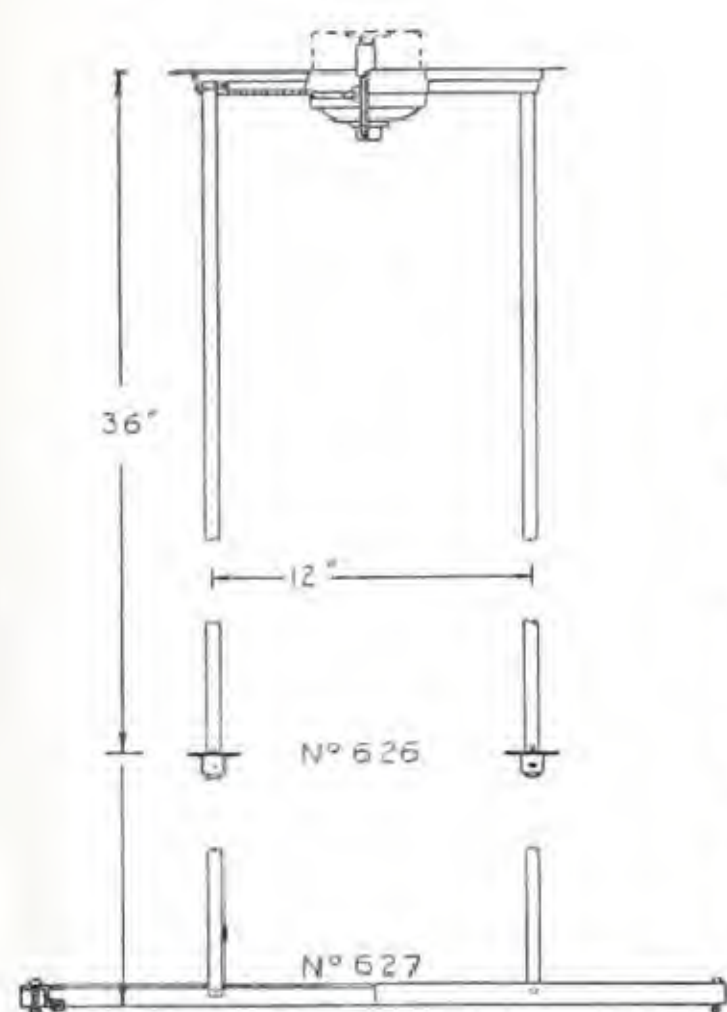


## ONE-STEM HANGER

Catalog No. 624

This hanger is composed of a single steel stem with a self-aligning canopy fitting. The lower end is threaded, and a locknut, two heavy washers and clamping nut are included. A knockout in the top of the Tranquilux is provided for fastening to stem.

Finish: Aluminum lacquered.



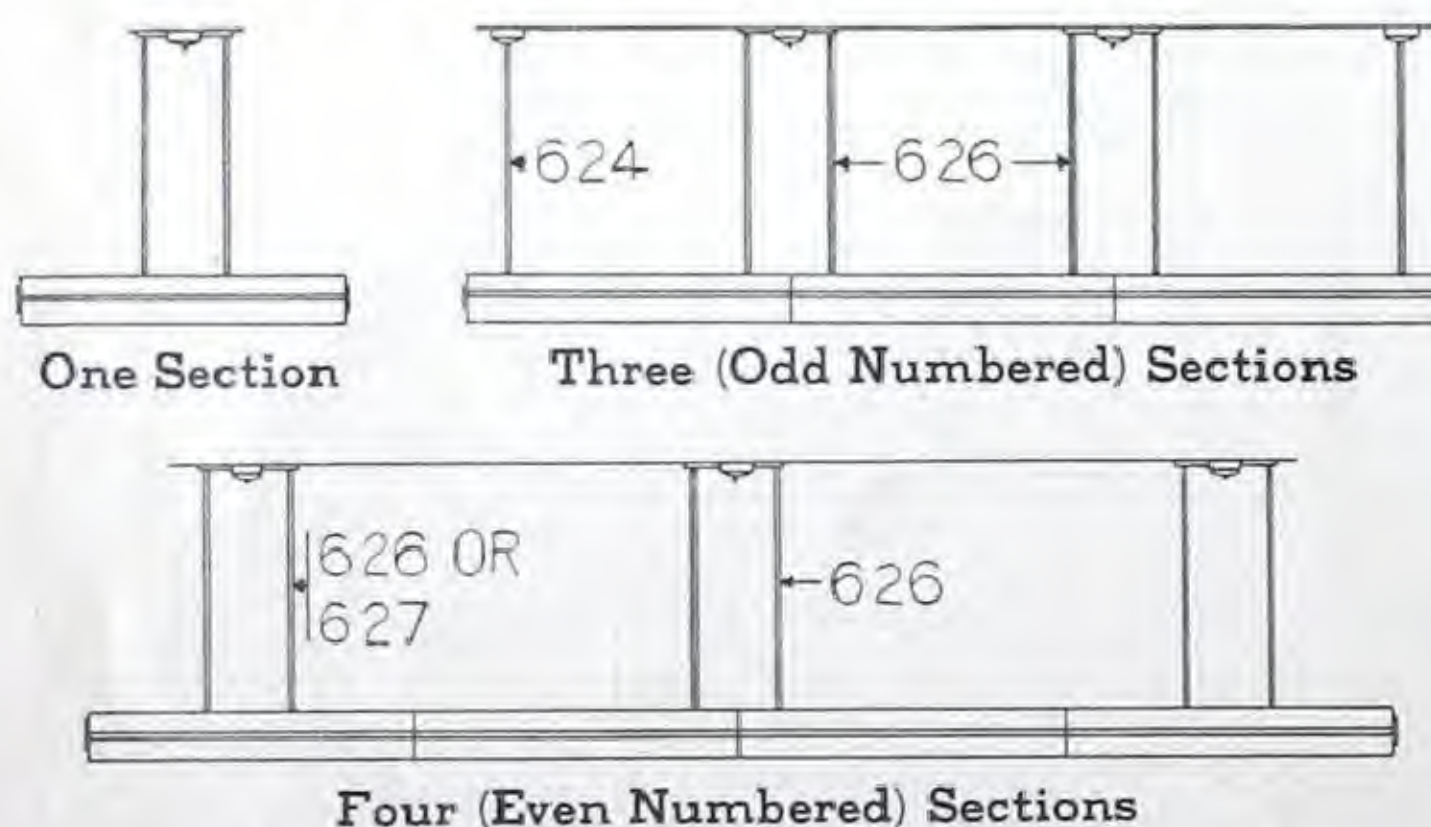
## TWO-STEM HANGERS

Catalog Nos. 626-627

These hangers consist of a cast canopy bar and two steel tube stems. Stems are held at top and bottom by heavy cotter pins. Standard suspension is 36" from ceiling to top of Tranquilux which can be shortened easily on the job by cutting off stems to new length and drilling  $\frac{1}{4}$ " hole in each stem. Use No. 626 hanger for Nos. 6227-C, 6247-C and 6247-F when hanger is at center of unit or on all units when hanger is over junction between two units. Use No. 627 hanger for Nos. 6227-F and 6237-C.

Finish: Aluminum lacquered.

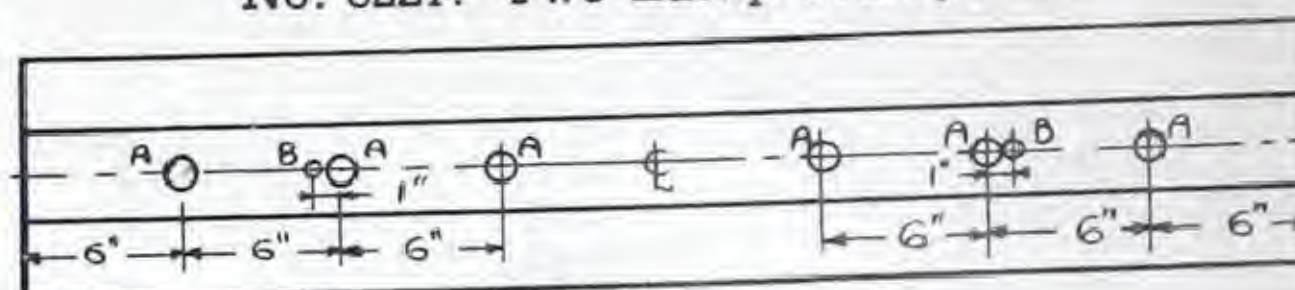
## SUGGESTED HANGER PLANS



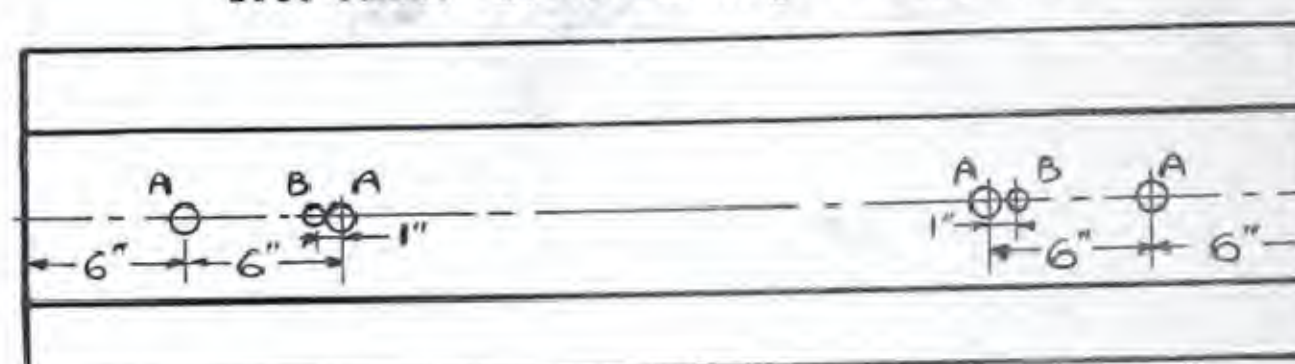
## KNOCKOUTS AND SUPPORTS

Knockouts are provided in the top of all Tranquilux units for use as wire entrance or for attachment to hangers. Quarter-inch holes ("B") are used for toggle or expansion bolts when units are mounted directly on the ceiling. "A" indicates location of knockouts for hangers.

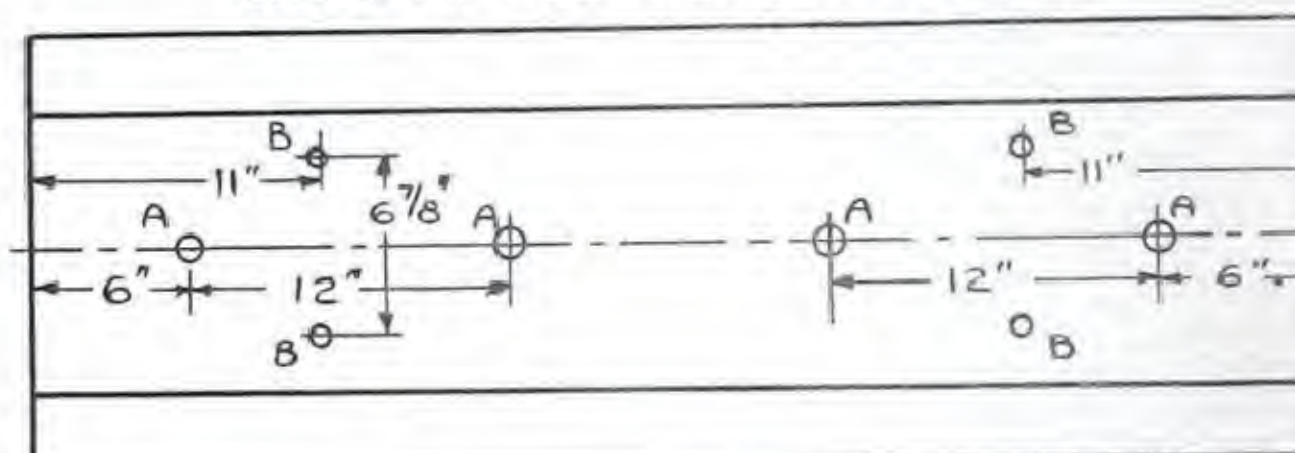
No. 6227. Two-Lamp Tranquilux



No. 6237. Three-Lamp Tranquilux



No. 6247. Four-Lamp Tranquilux



Curtis engineers are always available to help you get the best lighting results from our equipment. Send in your lighting problems.

Other Curtis products which are available for your use are:

- X-Ray Industrial Reflectors.
- X-Ray Show Window Reflectors.
- Indirect Lighting Luminaires.
- Fluorescent Industrial Units.
- Fluorescent Curtistrip.
- Germicidal Units.

**Curtis Lighting**  
OF CANADA, LTD.  
260 RICHMOND STREET WEST  
TORONTO



REVISED OCT. 1950 **L-4-2**  
CANCELS L-3-8 APR. 46

**NOR-ELECTRIC**



**BULLETIN**

ILLUMINATION DEPARTMENT



**CONTROLLED  
BY  
A TOUCH**

# **DAZOR** F L O A T I N G **LAMPS**

Float your light exactly where you want it . . . as quickly and easily as you move your arm. The Dazor Floating Lamp stays put without further adjustment or locking. Raise, lower, push or pull it; swing it through an arc; twist or turn it at an angle—wherever you stop the reflector it "stays put" until you change the position. The Dazor floating principle is entirely different from that of any other lamp, providing true finger-tip control for maximum convenience. It is the answer to efficient localized lighting—either fluorescent or incandescent.





To assist you with your specific lighting problems the Illumination Department of the Northern Electric Co., offer the services of experienced Lighting Engineers to discuss, plan, and layout your lighting problems with you.

We have also available for your convenience a series of Nor-Electric Bulletins dealing with lighting equipment, service and design.

We invite you to avail yourself of these services by completing this card and mailing it to us at any time we can be of assistance to you.

### Universal

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### Pedestal

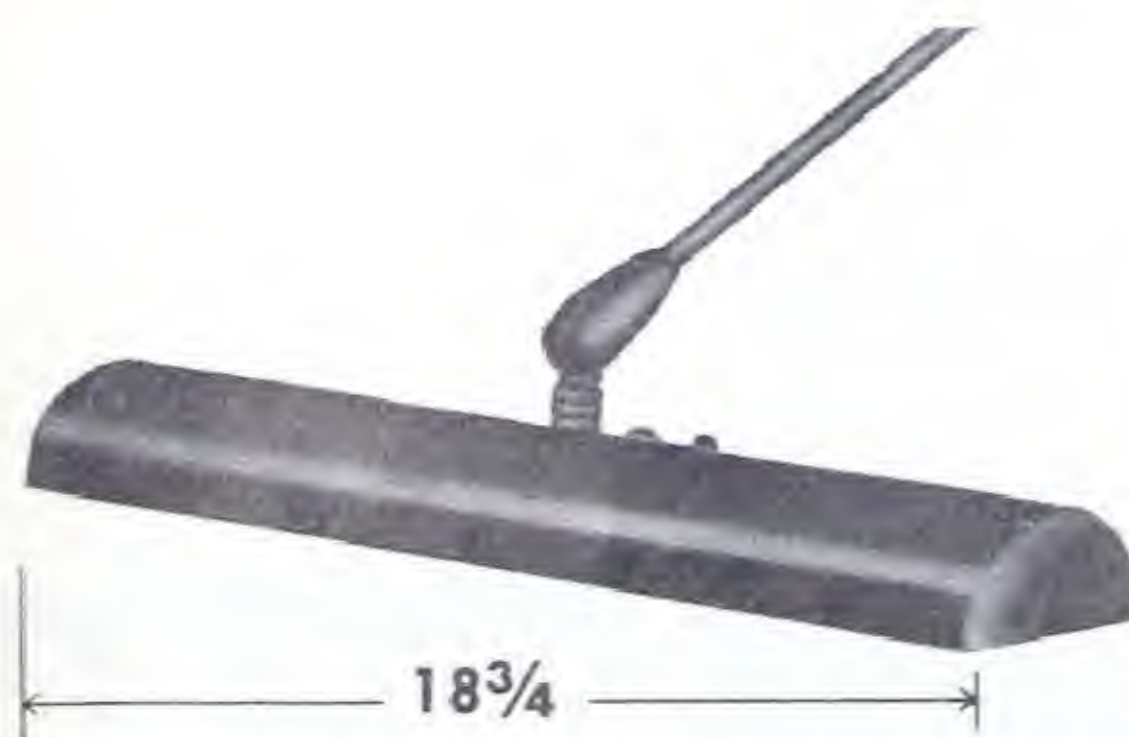
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### Dazor Ball

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they are in the lamp base.

**Dazor Manual Fluorescent Starter:** This is a combination line switch and manual starter built into a single unit. A patented Dazor development, it incorporates the following salient features:

1. Positive action, efficient and durable.
2. No periodic replacements required.



Using Two 15-WATT LAMPS

Catalogue Number	Circuit Voltage	Arm Extension
P-2124-16	110V—60C	24"
P-2134-16	110V—60C	34"

### UNIVERSAL MODEL

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from the base and a No. 7701 Rubber Cap.



For 40W or 60W Lamp

Catalogue Number	Arm Extension
3124	24"
3134	34"

The Universal Model fastens to practically all types of factory or machine shop equipment; lathes, drills, presses, shapers, milling machines, assembly benches, inspection tables. To work benches in garages . . . to repair benches in jewellery, engraving, radio, typewriter and bicycle shops . . . to tables or walls in dental, medical and chemical laboratories . . . to drawing boards . . . to business machines, desks, tables and files in offices . . . to desks and work benches in private homes, basements and garages. The 24" arm extension is recommended for average-size benches, machines, desks and stands; the 34" for drawing boards, executive desks and large working areas. The auxiliary equipment for the fluorescent model is installed in housing beneath the spring mechanism.

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lamp failure no current flows through the ballast, as the cathode heating circuit is always open (except when the red starter button is depressed for starting the tube), thus preventing wastage and overheating of the ballast.

5. The Dazor Manual Fluorescent Starter will function and start a tube at any temperature at which the tube itself will function.



## PEDESTAL MODEL

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord extending 8'9" from base, and a No. 7701 Rubber Cap.

### Using Two 15-WATT Lamps

Catalogue Number	Circuit Voltage	Arm Extension
P-2234-16	110V—60C	34"

The Pedestal Model is an all-purpose floor lamp, especially suitable for shops, physicians' offices, studios and homes. It is handy in the sick-room for nurses' use, or as a patient's night lamp. Furnished on request in White Baked Enamel Finish. Use the Pedestal Lamp in the home for reading, sewing or bridge. The auxiliary equipment for the fluorescent model is installed in the base.

### For 40W or 60W Lamps

Catalogue Number	Height of Pedestal	Arm Extension
3234	39"	34"

## BRACKET MODEL

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from base, and a No. 7701 Rubber Cap.

### For 40W or 60W Lamps

Catalogue Number	Arm Extension
3434	34"

The Bracket Model provides convenient, easily directed light for architects, draftsmen and artists. The goose-neck base attaches with screws to under side of drawing board, leaving top of board entirely free of obstruction. T-square may be used along upper edge and board cover may be rolled into hollow of the goose-neck fitting. This base is also adaptable to certain benches and machines. The auxiliary equipment for the fluorescent model is installed in housing beneath the spring mechanism.

### Using Two 15-WATT Lamps

Catalogue Number	Circuit Voltage	Arm Extension
P-2434-16	110V—60C	34"

## DESK MODEL

Equipped with 2-conductor No. 18 POSJ Midrip Brown Cord, extending 8'9" from base, and a No. 7701 Rubber Cap.

### Using Two 15-WATT Lamps

Catalogue Number	Circuit Voltage	Arm Extension
P-2324-16	110V—60C	24"

The Desk Model is portable, requiring no screws or clamps; base is weighted to support the floating arm in any position while resting on any level desk, table or stand. Convenient for flat-top desks of executives, architects, accountants, clerks. For slanting surfaces, such as drawing boards, specify the Universal or Bracket Model. The auxiliary equipment for the fluorescent model is installed in the base.

### For 40W or 60W Lamps

Catalogue Number	Arm Extension
3324	24"

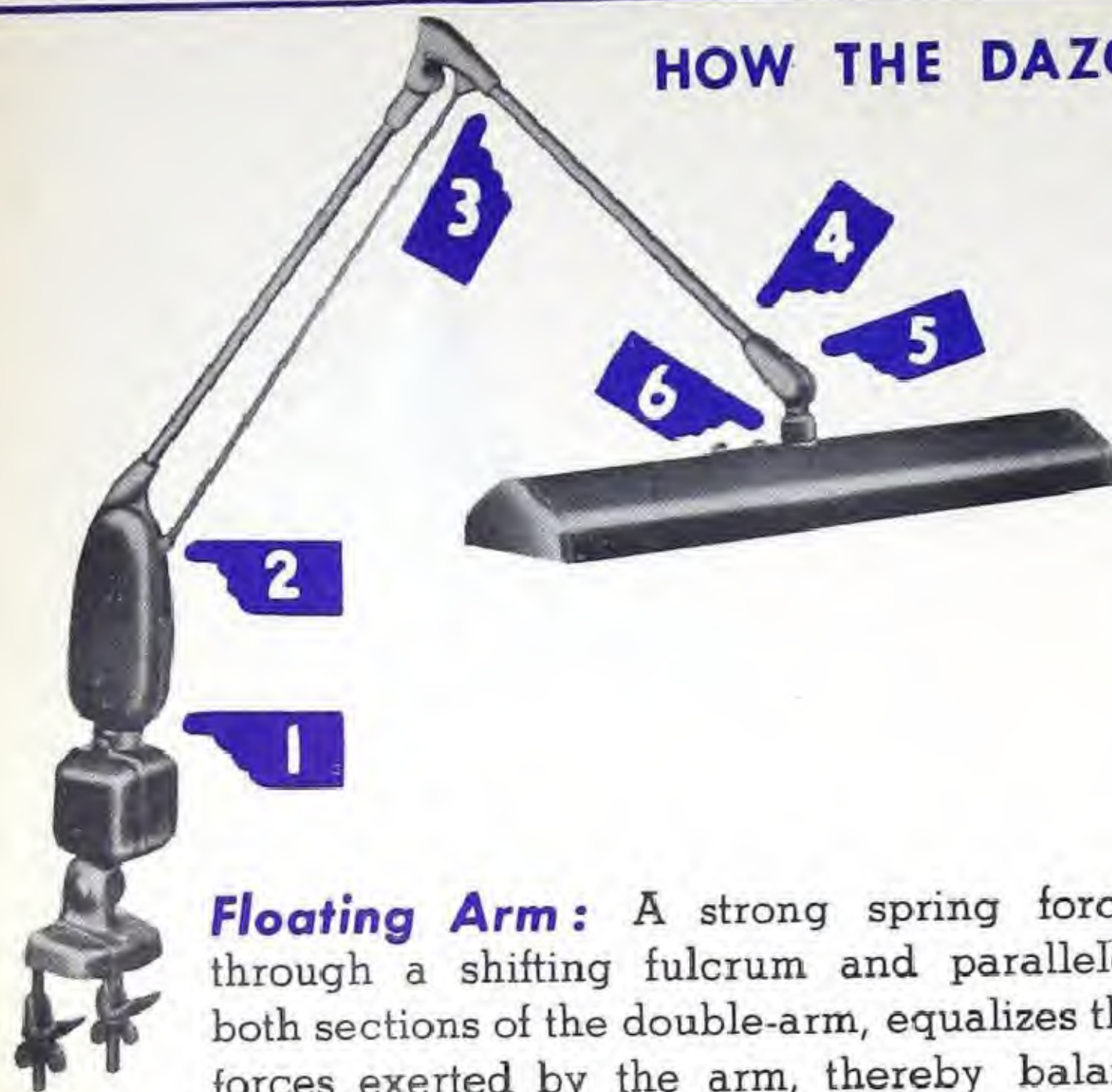
## FINISH

Standard finish statuary bronze baked enamel. Inner surface of reflector white baked enamel pedestal models may also be obtained with outside finish in white baked enamel.

## REFLECTORS

Reflectors All units are supplied complete with reflector.





## HOW THE DAZOR LAMP GETS ITS FLEXIBILITY

**Floating Arm:** A strong spring force, acting through a shifting fulcrum and parallelogram on both sections of the double-arm, equalizes the varying forces exerted by the arm, thereby balancing the arm in any position. This is a patented feature found only in Dazor Floating Lamps. The spring mechanism is entirely enclosed within a housing near the base.

**6-Swivel Combination:** Six different connections on a Dazor Floating Lamp respond to finger-tip control, together permitting any angular adjustment.

At (1) the main standard swings 305° laterally.

At (2) the arm moves through a vertical arc of 135°.

At (3) the elbow of the arm encloses an arc of 120°.

At (4) the reflector assembly rotates 360° around the arm.

At (5) the reflector assembly moves 185° in the knob of the arm.

At (6) the reflector pivots 305° around the socket.

The floating arm principle, coupled with the double-arm construction and the six swivel and hinge joints described above, results in extreme flexibility and ease of manipulation without further tightening or locking.

## WHICH KIND OF LIGHTING—FLUORESCENT OR INCANDESCENT?

The requirements of the individual task or machine, the state of general lighting, the user's preference—all of these help determine whether fluorescent or incandescent lighting will be best in a given installation. A few principles, however, can be stated.

Fluorescent Lamps have quickly become popular because they provide a cool diffused light; the result is clear, pleasing illumination without eye-strain. Fluorescent tubes consume less current per foot-candle of illumination.

Incandescent Lamps are especially suitable for concentrated lighting of a limited area or for close inspection.

Each type is giving complete satisfaction in thousands of applications. Remember that the Dazor floating arm permits the reflectors of both Fluorescent and Incandescent Models to be placed wherever the user desires, giving accurate control over (1) intensity and (2) glare—the two most important factors in any lighting system.

## A COMPLETE LIGHTING SERVICE

NOR-LECTRIC BULLETINS ON ALL TYPES OF LIGHTING AVAILABLE UPON REQUEST

Dept. 65, 1600 Notre Dame St. W., Montreal, P.Q.

For efficient operation of the modern business organization, critical seeing tasks must be performed **CONSTANTLY—ACCURATELY** and **SPEEDILY**. Adequate lighting does much to achieve these objectives by protecting the employees' eyesight and providing a pleasant working environment.

### FOR "ADEQUATE" LIGHTING

COMMERCIAL • INDUSTRIAL • STREETLIGHTING • FLOODLIGHTING  
SPORTS LIGHTING • SCHOOL LIGHTING • RESIDENTIAL

CONSULT

# Northern Electric

COMPANY LIMITED

7M-10-50

HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
FORT WILLIAM WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA





NOR-ELECTRIC



BULLETIN

# PRESENTING

*Commercial*

## FLUORESCENT LUMINAIRES

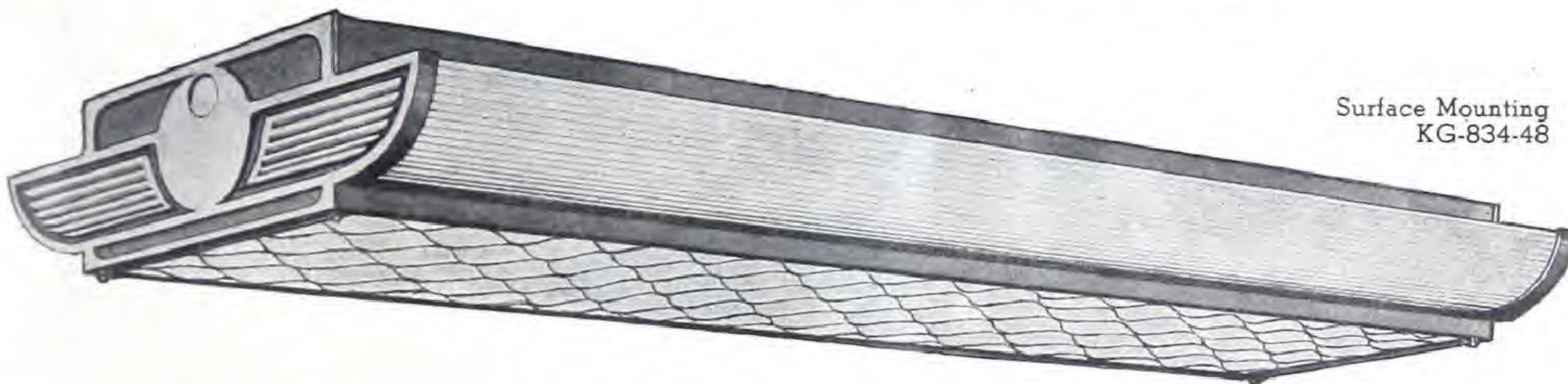
*with*

## CORNING **ALBA-LITE** GLASS

ALBA-LITE Lightingware is what the lighting industry has been waiting for. This is the answer to the needs of Modern Fluorescent Lighting. Here are some of the outstanding features of ALBA-LITE.

**Homogeneous Glass.** Light diffusion is secured through the special homogeneous composition of ALBA-LITE rather than through surface treatment. The result is a smooth, easy-to-clean-surface and permanent, uniform color.

**High Light Efficiency.** A translucent glass with high light transmission and low light absorption.



Surface Mounting  
KG-834-48

This modern, streamlined unit, is designed to fill the demand for a fixture that will give both direct and indirect lighting. All the elements of correct design have been incorporated in this outstanding unit, combining high efficiency, minimum glare, and low maintenance. This luminaire is easily one of the most attractive in the commercial field. Light from the four 40W lamps is shielded by metal louvers or a ribbed ALBA-LITE glass bottom. Curved ALBA-LITE glass side panels shield the lamps and add to the smart, streamlined appearance. Made for stem or surface mounting as single units or continuous rows. Louvre is finished in baked white enamel, harmonizing with the rest of the fixture. This fixture is equipped with no-blink starters.

Finish: Satin Pewter. All reflecting surfaces baked, hard, white enamel.

Will be supplied for surface mounting unless otherwise specified. Hangers for suspension mounting must be ordered separately.

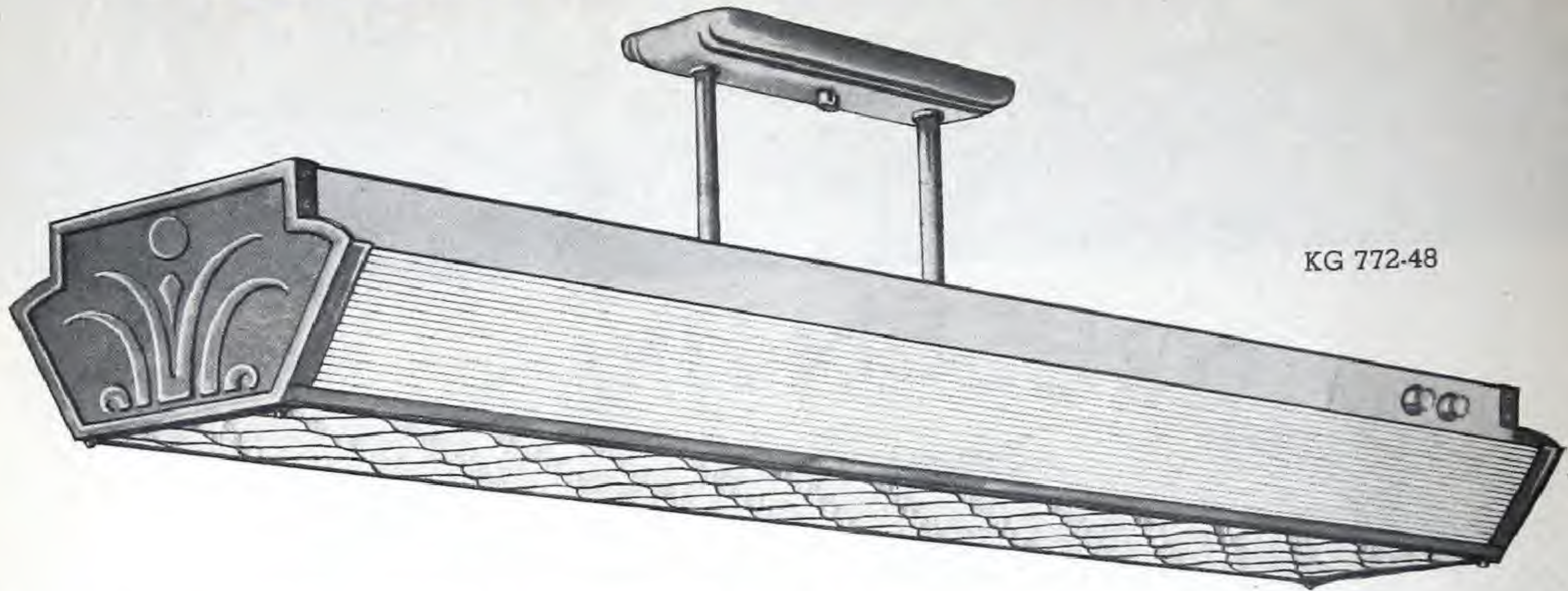
	Cat. No.	Lamps	Watts per Lamp	Width	Body Dimensions Height	Length	Height Overall with Hangers
Louvre .....	KG 834-48	4	40	17 $\frac{7}{8}$ "	6 $\frac{3}{8}$ "	49 $\frac{1}{2}$ "	36"
Glass .....	KG 824-48	4	40	17 $\frac{7}{8}$ "	6 $\frac{3}{8}$ "	49 $\frac{1}{2}$ "	36"



Continuous Row



## COMMERCIAL FLUORESCENT LUMINAIRES



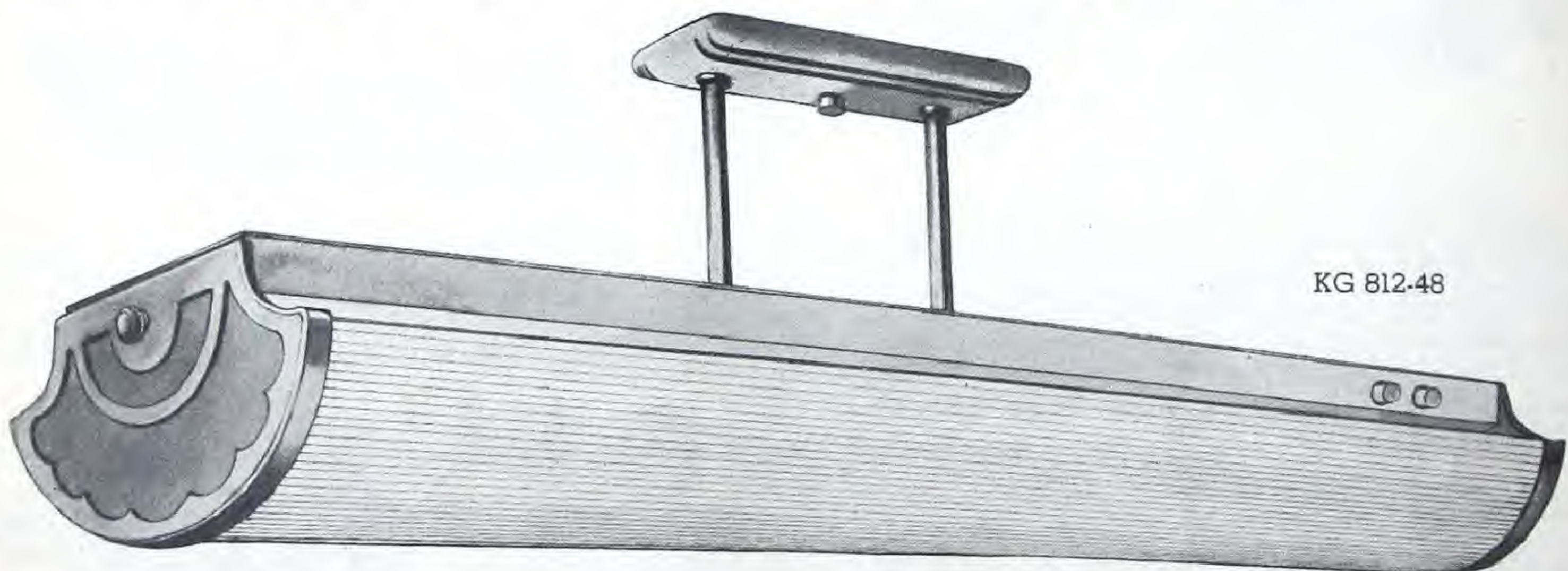
KG 772-48

Here we have a particularly good looking fluorescent lighting fixture that combines the beauty of glass with the metal craftsman's art. The side ALBA-LITE glass panels are very effective and immediately distinguish this fixture from all others in its price range. The bottom of the fixture can be left open or with the addition of an exclusive metal louvre it creates a pleasing effect without materially impairing the light output. Louvre is finished in baked white enamel, harmonizing with the rest of the fixture. Or, in place of the louvre, a ribbed ALBA-LITE glass panel in the bottom adds greatly to the decorative effect of the unit. Either of these parts can be inserted or removed easily from the fixture. A knock-out at each end of the fixture makes it possible to butt them end to end for installation in continuous rows. This fixture is equipped with no-blink starters.

Finish: Satin Pewter. All reflecting surfaces baked, hard, white enamel.

Will be supplied for surface mounting unless otherwise specified. Hangers for suspension mounting must be ordered separately.

	Cat. No.	Lamps	Watts per Lamp	Body Dimensions			Height Overall with Hangers
				Width	Height	Length	
With open bottom	KG 762-48	2	40	10"	7 1/2"	49 1/2"	36"
	KG 763-48	3	40	12 1/2"	7 1/2"	49 1/2"	36"
	KG 764-48	4	40	12 1/2"	7 1/2"	49 1/2"	36"
With louvre	KG 772-48	2	40	10"	7 1/2"	49 1/2"	36"
	KG 773-48	3	40	12 1/2"	7 1/2"	49 1/2"	36"
	KG 774-48	4	40	12 1/2"	7 1/2"	49 1/2"	36"
With glass bottom panel	KG 782-48	2	40	10"	7 1/2"	49 1/2"	36"
	KG 783-48	3	40	12 1/2"	7 1/2"	49 1/2"	36"
	KG 784-48	4	40	12 1/2"	7 1/2"	49 1/2"	36"



KG 812-48

For a soft smooth, "easy on the eye" unit, there are few that will compare favorably with this fixture. This particular type of fixture, with its special glass diffuser, not only permits maximum light passage, but also increases the spread of light through the use of this scientifically designed glass diffuser. We readily recommend this fixture to the purchaser who has efficiency plus the appearance of his establishment to consider. This fixture is equipped with no-blink starters.

Cannot be used for continuous rows.

Finish: Satin Pewter. All reflecting surfaces baked, hard, white enamel. Diffuser is made of Skytex glass.

Will be supplied for surface mounting unless otherwise specified. Hangers for suspension mounting must be ordered separately.

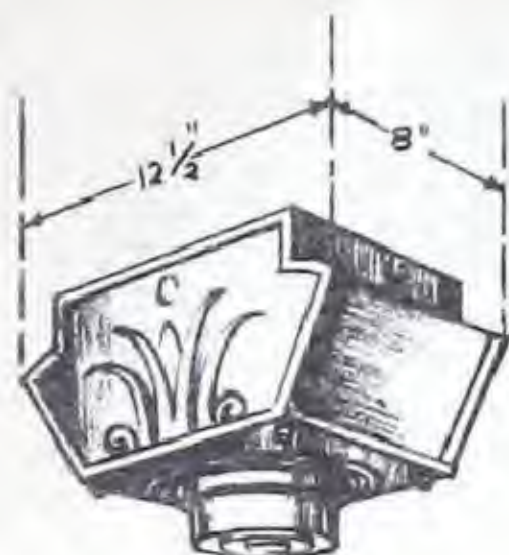
Cat. No.	Lamp	Watts per Lamp	Body Dimensions			Height Overall with Hangers
			Width	Height	Length	
KG 812-48	2	40	8 7/8"	5 3/4"	49 1/2"	36"
KG 813-48	3	40	11"	6 3/4"	49 1/2"	36"
KG 814-48	4	40	11"	6 3/4"	49 1/2"	36"



# NOR-ELECTRIC



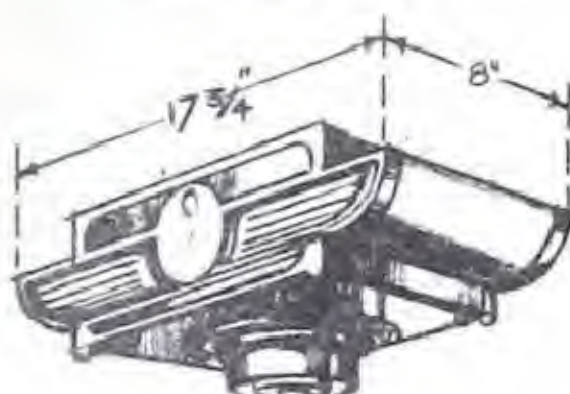
# BULLETIN



No. 5 761.  
SPOTLITE UNIT.



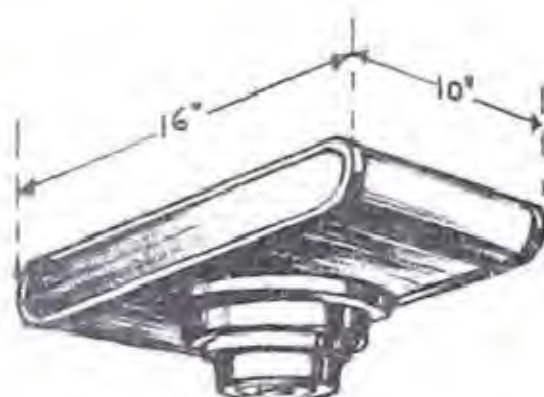
SHOWING No. 5 761 MOUNTED AT ENDS AND  
BETWEEN No. KG. 774-48 UNITS IN CONTINUOUS LINE.



No. 5 831.  
SPOTLITE UNIT.



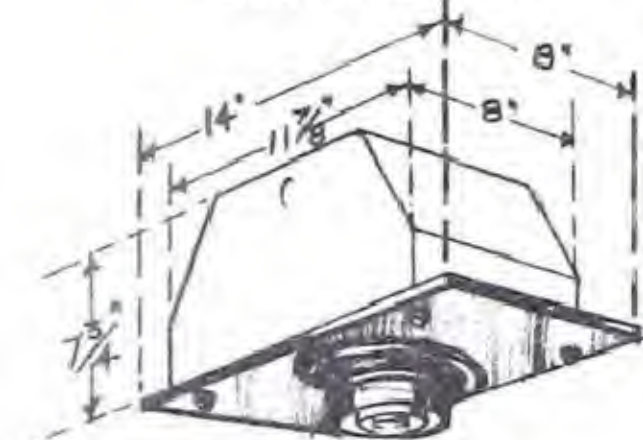
SHOWING No. 5 831. MOUNTED AT ENDS AND  
BETWEEN No. KG 834-48 UNITS IN CONTINUOUS LINE.



No. 5 841.  
SPOTLITE UNIT.



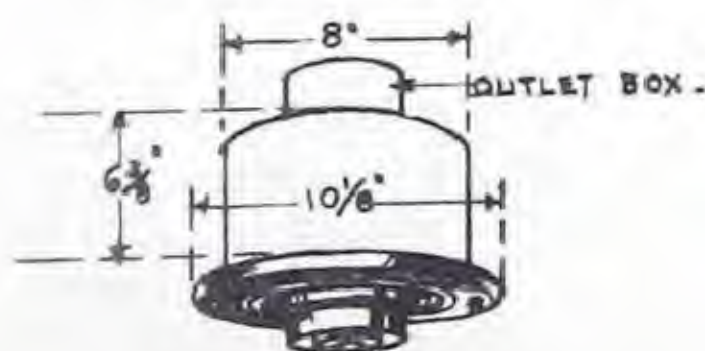
SHOWING No. 5 841. MOUNTED AT ENDS AND  
BETWEEN No. KP. 844-48 UNITS IN CONTINUOUS LINE.



No. 5 861.  
SPOTLITE UNIT.



SHOWING No. 5 861. MOUNTED AT ENDS AND  
BETWEEN No. K. 862-48, No. K862-48 OR No. K 864-48  
UNITS IN CONTINUOUS LINE.



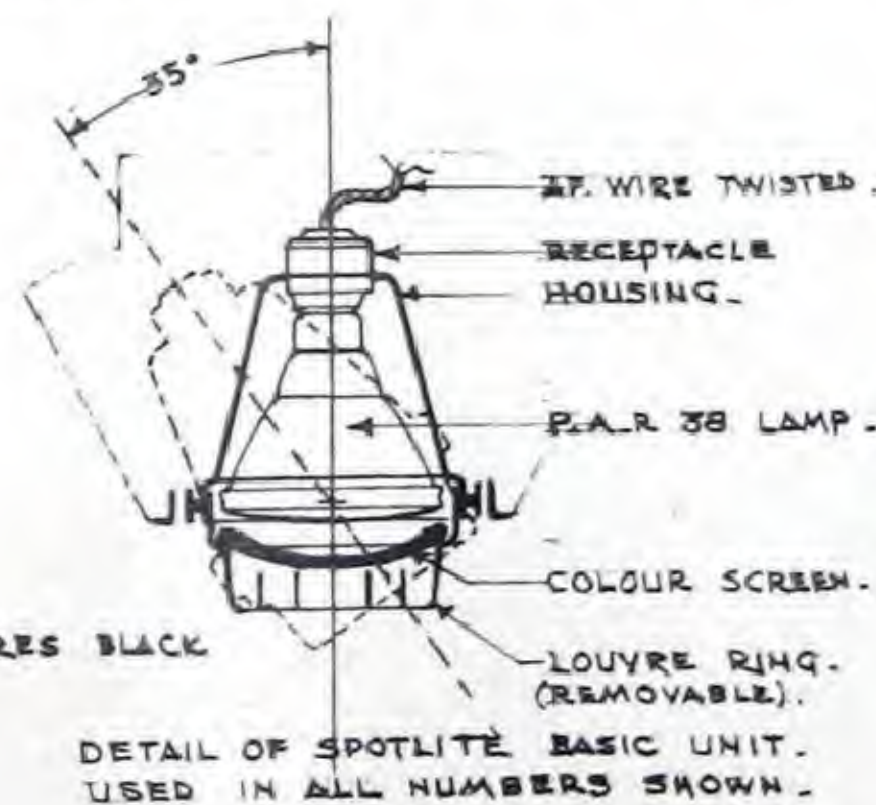
No. 5 701  
SPOTLITE UNIT,  
RECESSED.



No. 5 711  
SPOTLITE UNIT.  
SURFACE MOUNTED.

ALL FINISHED IN  
SATIN PEWTER.

INSIDE OF LOUVRES BLACK



DETAIL OF SPOTLITE BASIC UNIT.  
USED IN ALL NUMBERS SHOWN.

**SPOTLITE UNITS.**  
FOR MOUNTING IN CONJUNCTION  
WITH FLUORESCENT FIXTURES.  
ALSO FOR INDIVIDUAL MOUNTING  
IN RECESSED AND SURFACE TYPES  
FOR USE WITH PAR 38 SPOT  
OR FLOOD LAMPS AND STANDARD  
COLOUR SCREENS.

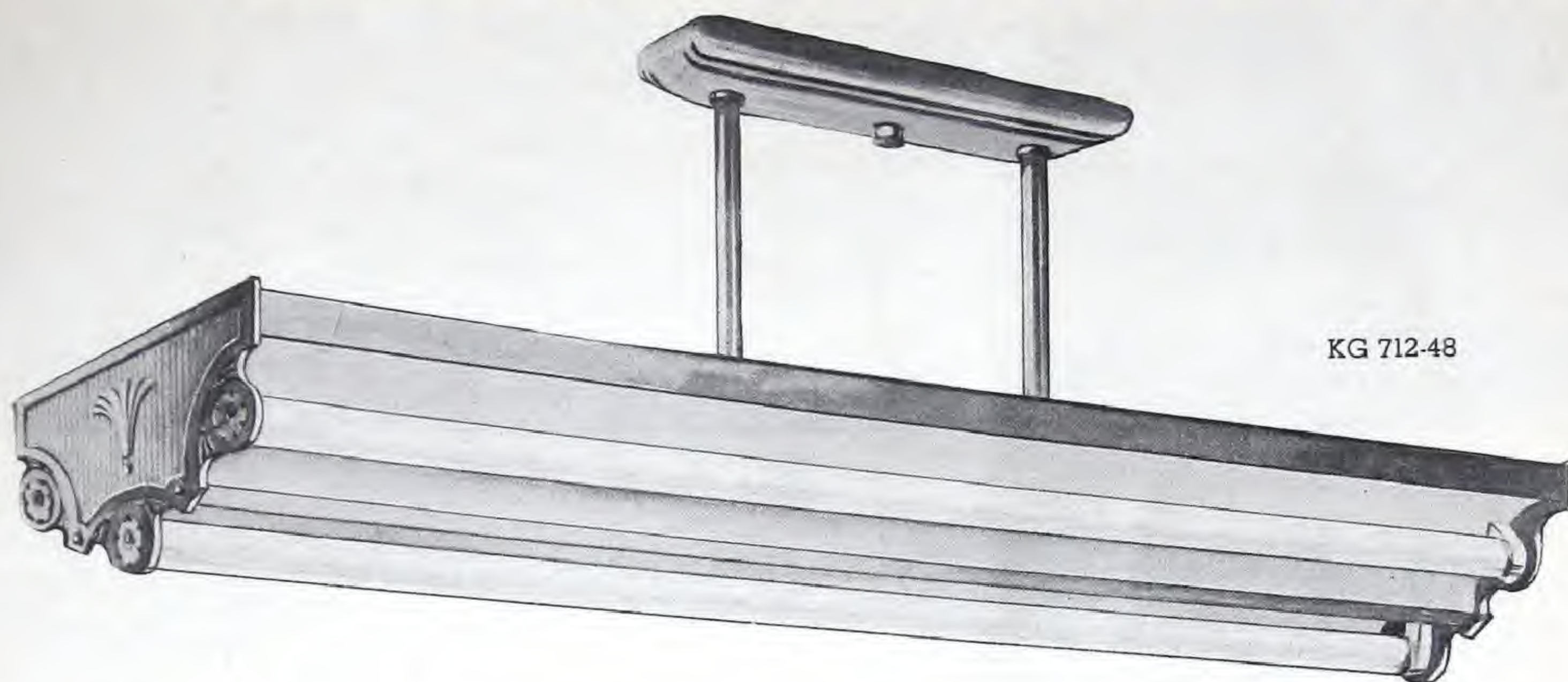
**ELECTROLIER MFG. CO. LTD.**  
M O N T R E A L.







## COMMERCIAL FLUORESCENT LUMINAIRES



KG 712-48

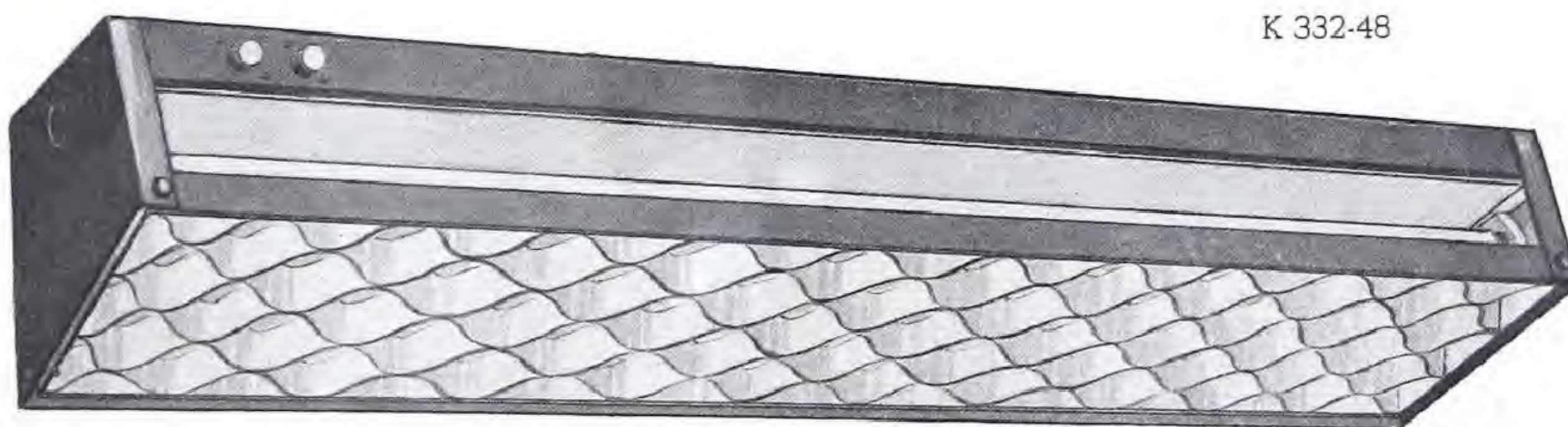
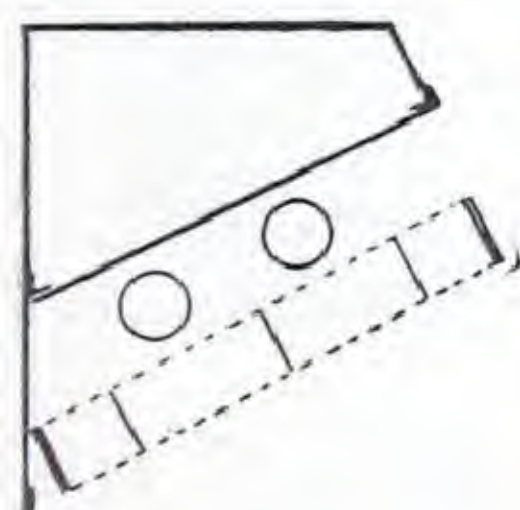
Developed to meet popular demand, this new fluorescent fixture is suitable for a wide range of commercial applications and is designed to harmonize with most modern decorative treatments. This fixture is equipped with no-blink starters.

Finish: Satin Pewter. All reflecting surfaces scientifically treated baked, hard, white enamel.

Will be supplied for surface mounting unless otherwise specified. Hangers for suspension mounting must be ordered separately.

Cat. No.	Lamps	Watts per Lamp	Body Dimensions		Length	Height Overall with Hangers
			Width	Height		
K 712-48.....	2	40	9 1/4"	5 1/2"	49"	36"
K 713-48.....	3	40	12"	6 3/4"	49"	36"
K 714-48.....	4	40	12 1/2"	7 1/2"	49"	36"

## SHOW WINDOW AND DISPLAY LIGHTING



K 332-48

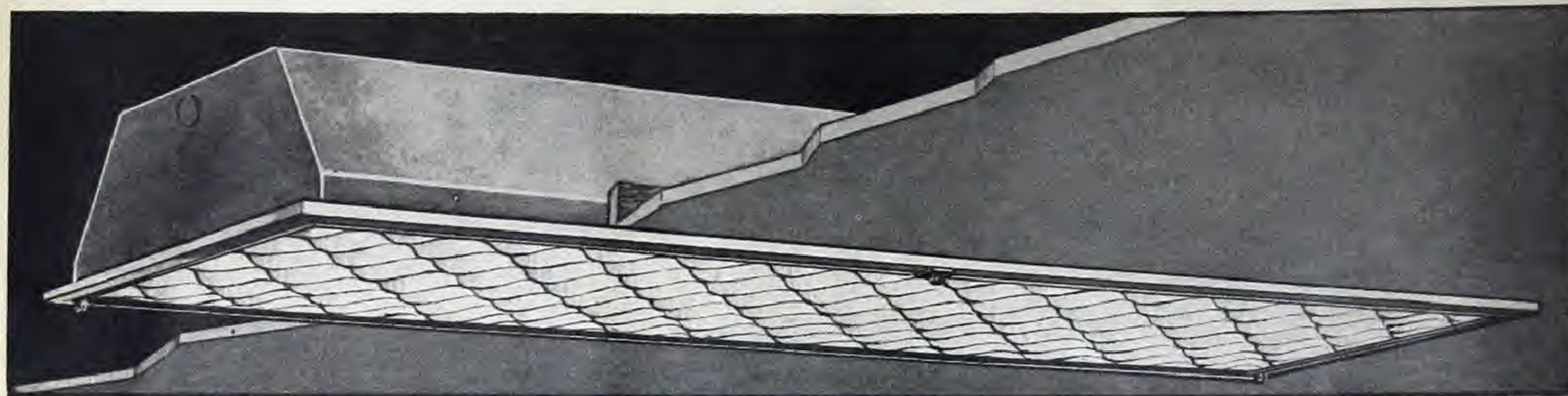
These fixtures are designed to attractively illuminate show windows or large displays. They can be used individually or butted together for continuous rows. 1/2" knockouts in the ends accommodate pipe or BX. The deep edge should be placed against the window. The shape of these fixtures directs the light downward onto the display. The metal louvre shown on the illustration hides the lamps but does not impair the efficiency. It is hinged to the body of the fixture and can be easily removed for cleaning and relamping. This fixture is equipped with no-blink starters.

Finish: Hard, baked, white enamel.

	Cat. No.	Lamps	Watts per Lamp	Dimensions of Body		Total Depth	Length
				Width	Height		
Without Louvre	K322-24.....	2	20	8"	6 3/4" x 3 7/8"	7 1/4"	24 1/4"
	K322-48.....	2	40	8"	6 3/4" x 3 7/8"	7 1/4"	48 1/4"
	K323-24.....	3	20	10 3/4"	9 1/2" x 4 3/4"	8"	24 1/4"
	K323-48.....	3	40	10 3/4"	9 1/2" x 4 3/4"	8"	48 1/4"
	K324-24.....	4	20	13"	12" x 5 3/8"	8 3/4"	24 1/4"
	K324-48.....	4	40	13"	12" x 5 3/8"	8 3/4"	48 1/4"
With Louvre	K332-24.....	2	20	8"	6 3/4" x 3 7/8"	7 1/4"	24 1/4"
	K332-48.....	2	40	8"	6 3/4" x 3 7/8"	7 1/4"	48 1/4"
	K333-24.....	3	20	10 3/4"	9 1/2" x 4 3/4"	8"	24 1/4"
	K333-48.....	3	40	10 3/4"	9 1/2" x 4 3/4"	8"	48 1/4"
	K334-24.....	4	20	13 3/4"	12" x 5 3/8"	8 3/4"	24 1/4"
	K334-48.....	4	40	13 3/4"	12" x 5 3/8"	8 3/4"	48 1/4"

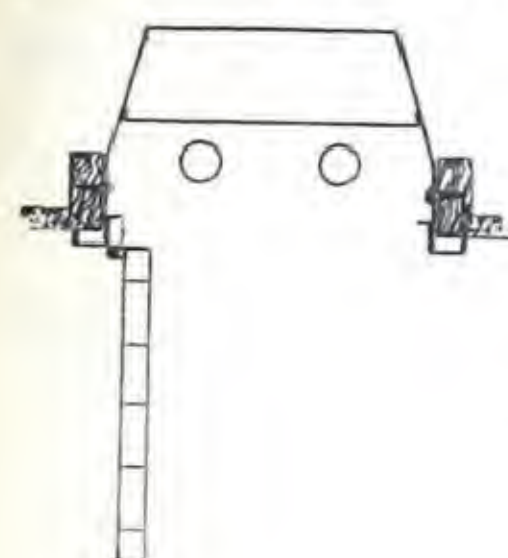


## RECESSED TROFFER LIGHTING



K 862-48

For built-in, flush-to-ceiling fluorescent lighting, these troffers are designed for easy installation and maintenance and are engineered for high efficiency, without glare. Suitable for single installation or in continuous rows. The louvers are hinged to the body of the fixture so that they may be easily removed for cleaning and relamping. The louvers are particularly useful in preventing glare in all normal viewing angles, and in preventing eyestrain when looking down the length of a fixture or a line of lights. At the same time the louvers allow a maximum amount of light to be projected downward. This fixture is equipped with no-blink starters. This fixture can also be supplied with a ribbed glass panel at the bottom.



	Cat. No.	Lamps	Watts per Lamp	Box Size	Frame Size	Total Depth
With Louvre	K 862-48	2	40	11 7/8" x 48 1/8"	14" x 50"	8"
	K 863-48	3	40	11 7/8" x 48 1/8"	14" x 50"	8"
	K 864-48	4	40	11 7/8" x 48 1/8"	14" x 50"	8"
Without Louvre	KG 872-48	2	40	11 7/8" x 48 1/8"	14" x 50"	8"
	KG 873-48	3	40	11 7/8" x 48 1/8"	14" x 50"	8"
	KG 874-48	4	40	11 7/8" x 48 1/8"	14" x 50"	8"

## SMART MODERN FLUORESCENT DIRECTION SIGNS



KG 636-18  
Letters white—Background red



KG 646-18  
Letters white—Background blue

These fluorescent signs are the last word in effectiveness and decorative appeal. All are finished in Satin Pewter, and have ceramically-treated glass fronts. Designed for using one 15-watt fluorescent lamp.

Cat. No.	Description	Letters	Background	Body Dimensions		
				Width	Extends	Length
KG 636-18	Exit	White	Red	4 1/2"	4 1/2"	20"
KG 638-18	Gentlemen	Blue	White	4 1/2"	4 1/2"	20"
KG 639-18	Ladies	Blue	White	4 1/2"	4 1/2"	20"
KG 646-18	Information	White	Blue	4 1/2"	4 1/2"	20"
KG 648-18	Telephones	Blue	White	4 1/2"	4 1/2"	20"

**Northern Electric**  
COMPANY LIMITED

HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA  
VAL D'OR TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
PORT ARTHUR WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA





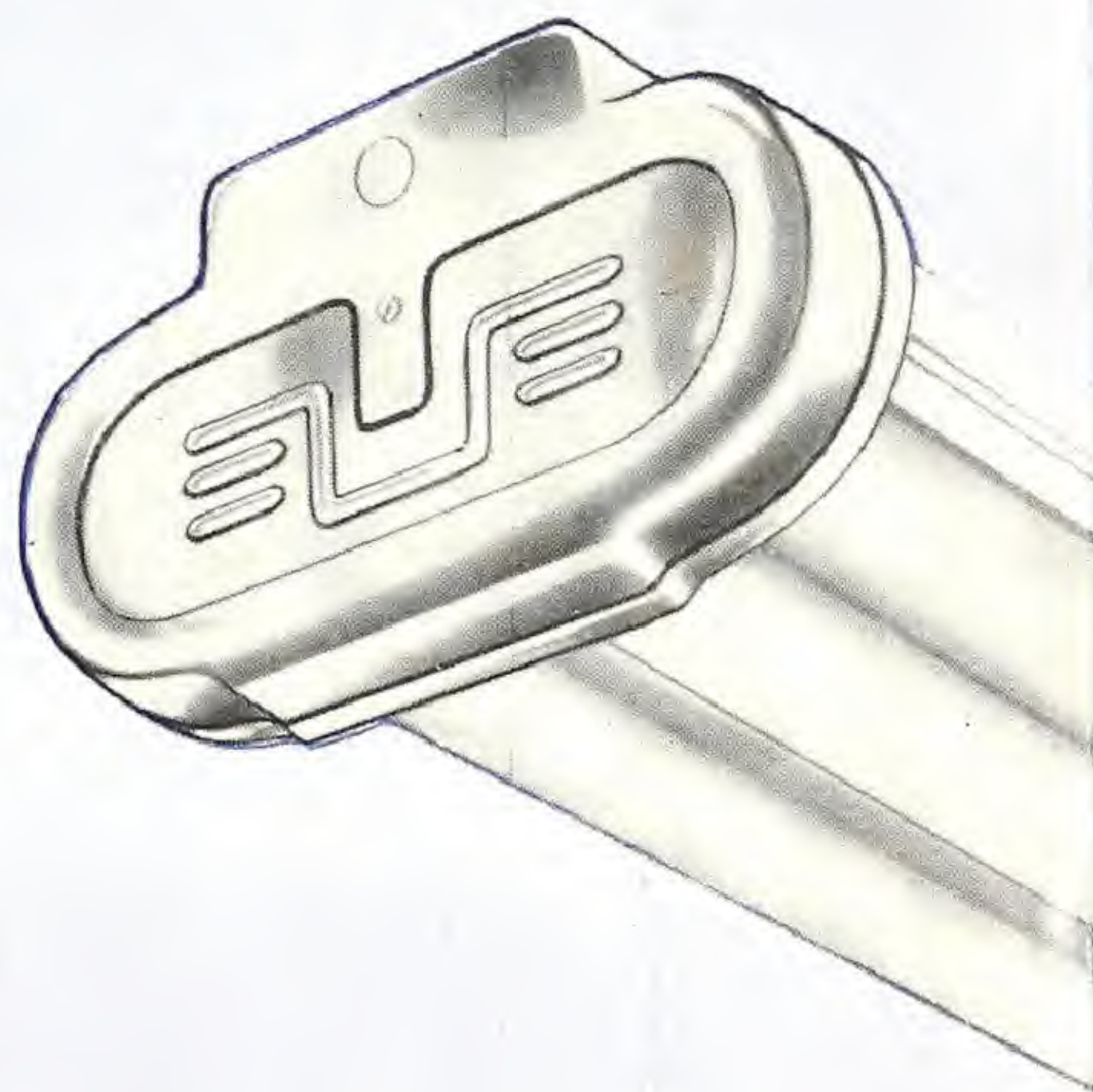
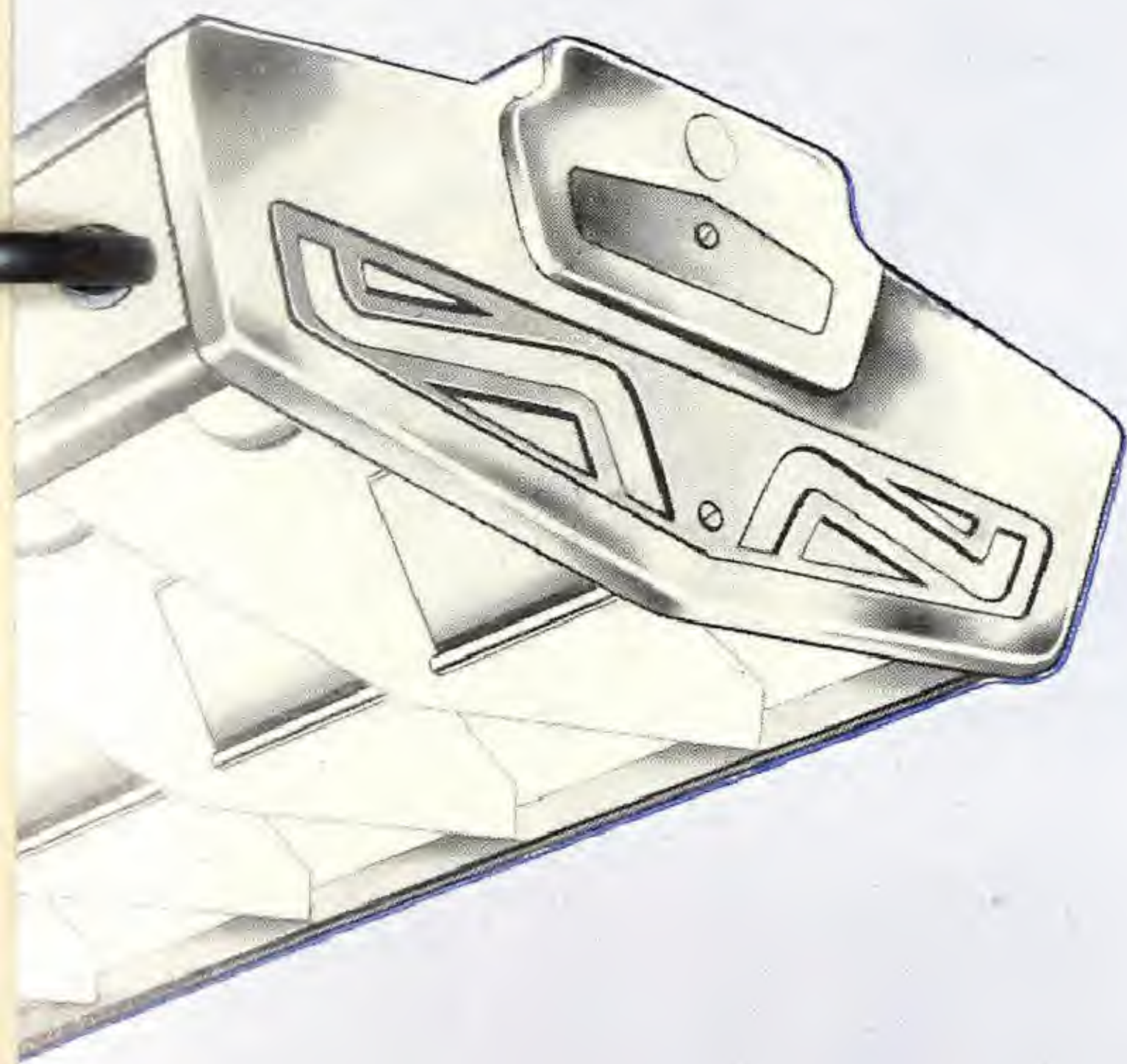
Revised May 1948 L-4-5

NOR-ELECTRIC



BULLETIN

# *Day Brite*

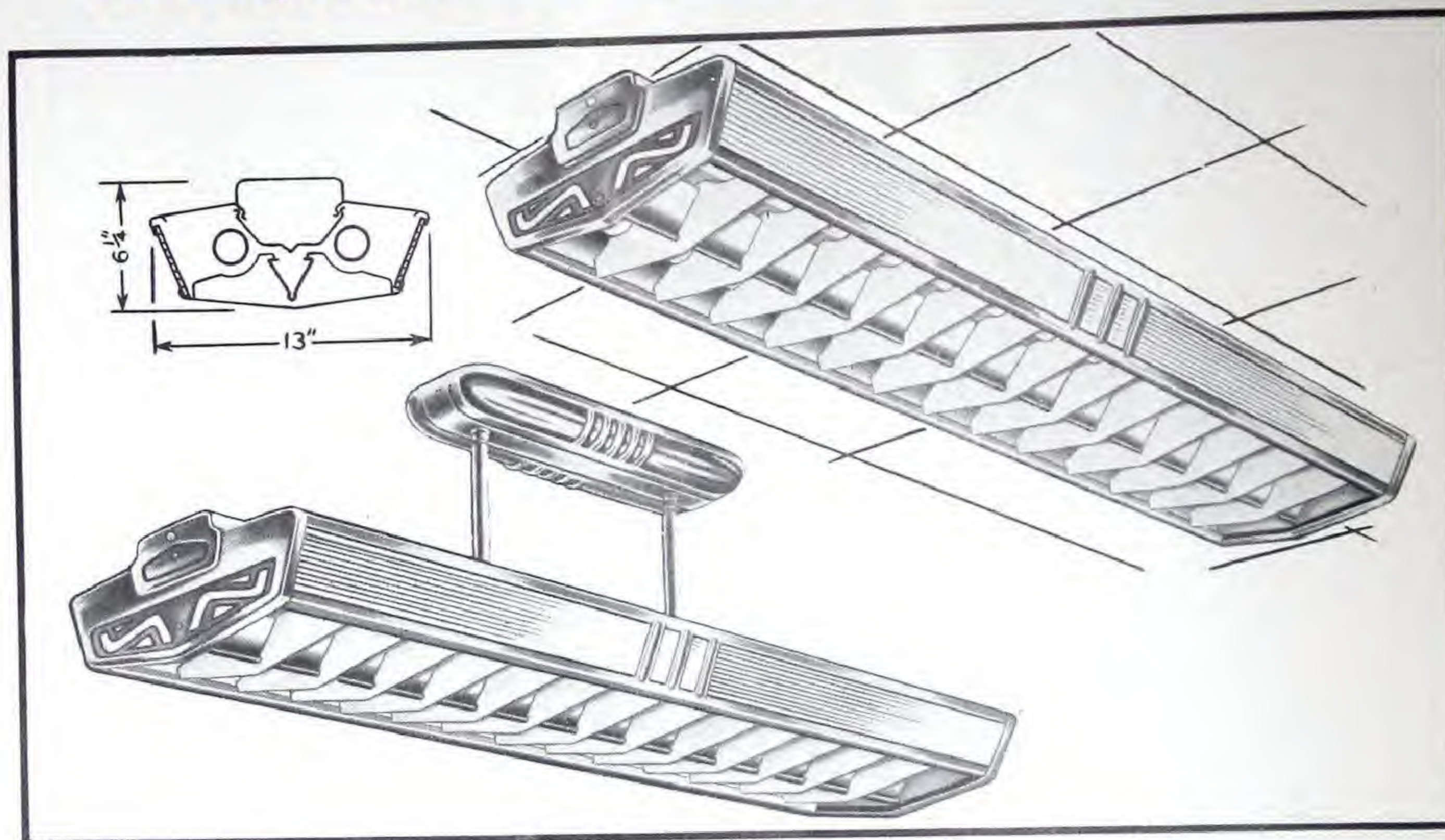


**VIZ-AID and TOPNOTCH**  
*Commercial Lighting Units*



# THE DAY-BRITE "VIZ-AID"

Two-Lamp Fixtures for 40-Watt and 100-Watt Fluorescent Lamps



Shielded units for two 40-watt fluorescent lamps . . . surface or suspension mounting.

**Chassis**—Die-formed and welded steel construction with snap-on wireway cover. Finish, baked SUPER-WHITE enamel.

**Snap-on Enclosure**—Steel frame of die-formed and welded construction, finished in baked lustre aluminum enamel. End cut-outs backed with translucent plastic. Lateral louvers finished in baked SUPER-WHITE enamel with the V-shaped centre louver in specular Alzak finish, engineered to provide additional light output in the useful area of illumination. The side panels are of ribbed, diffuse glass.

**Servicing**—The snap-on enclosure is supported to the chassis by spring tension clips and is easily lowered without the use of tools. Service

chains support the enclosure when it is released from the chassis for cleaning. These chains can be unhooked from the chassis for complete removal of the enclosure if desired. Units can be relamped without disturbing the enclosure.

**Mounting**—Chassis is arranged for either surface or suspension mounting. Suspension type units include all necessary parts for complete installation. Hangers are finished in baked lustre aluminum enamel and have swivel fittings.

**Suspension Mounting**—Suspension type units are made up of one surface type unit and one No. 9925 hanger. Order each item separately.

**Wiring**—All fixtures are furnished wired and include starters, sockets and ballast for 110-volt, 60-cycle or 25-cycle, A.C. operation.

FOR LAMPS		Cycles	Catalog No.	DIMENSIONS				Approx. Ship. Wgt.
No.	Size			Body Length	Body Width	Body Height	Overall Height*	
FOR SURFACE MOUNTING								
2	40 Watts—110 Volts	60	46202-60	48½"	13"	6¼"	...	35 lbs.
2	40 Watts—110 Volts	25	46202-25	48½"	13"	6¼"	...	43 lbs.
2	100 Watts—110 Volts	60	55202-60	61"	16¼"	8"	.....	58 lbs.
HANGER FOR SUSPENSION MOUNTING								
.....	.....	.....	9925	.....	.....	27"	33¼"*	6 lbs.

Fluorescent lamps are not supplied.

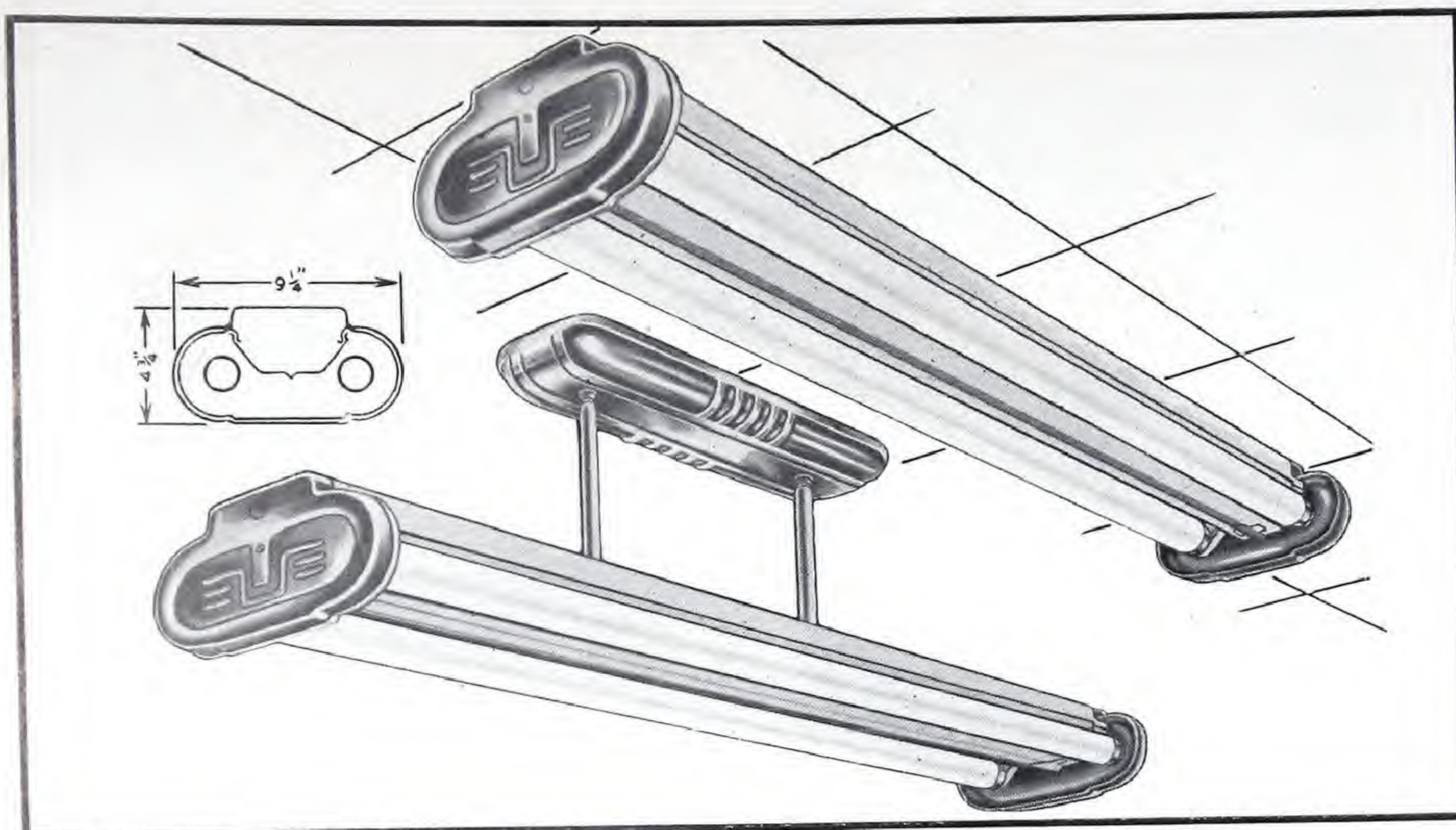
\*Assembled with fixture.



# THE DAY-BRITE "TOPNOTCH"

## TWO LAMP 40-WATT OPEN TYPE UNITS

Patented



Complete open type units for two 40-watt Fluorescent lamps. These lighting units have many applications. They are efficient and easy to install and maintain. They are designed for both surface and suspension mounting.

**Chassis**—The chassis is steel . . . of die-formed and welded construction. The wireway cover snaps into position on the chassis and is easily removed for access to wiring and sockets. Entire chassis is finished in baked SUPER-WHITE enamel.

**End Plates**—The decorative end plates are of die-formed steel and are finished in baked lustre aluminum enamel. They are supported on the chassis by a single screw and do not have to be removed for relamping.

**Mounting**—For surface mounting, the chassis is provided with all necessary holes and knock-outs for quick fastening to ceiling and for wire connections. For suspension mounting, hangers include bridge-type ceiling strap, stems, swivel fittings, wire, stamped canopy and all necessary parts for complete installation. Finish, baked lustre aluminum enamel.

**Suspension Mounting**—Suspension type units are made up of one surface type unit and one No. 9925 hanger. Order each item separately.

**Wiring**—All units are furnished wired and include starters, sockets and high power factor ballasts for 110-volt, 60-cycle, A.C. operation.

(Not recommended for 25 cycle.)

FOR LAMPS		Cycles	Catalog No.	DIMENSIONS				Approx. Ship. Wgt.
No.	Size			Body Length	Body Width	Body Height	Overall Height*	
FOR SURFACE MOUNTING								
2	40 Watts—110 Volts	60	46200-60	48 $\frac{1}{2}$ "	9 $\frac{1}{4}$ "	4 $\frac{3}{4}$ "	.....	21 lbs.
2	40 Watts—110 Volts	25	46200-25	48 $\frac{1}{2}$ "	9 $\frac{1}{4}$ "	4 $\frac{3}{4}$ "	.....	29 lbs.
HANGER FOR SUSPENSION MOUNTING								
.....	.....	.....	9925	.....	.....	27"	31 $\frac{3}{4}$ "**	6 lbs.

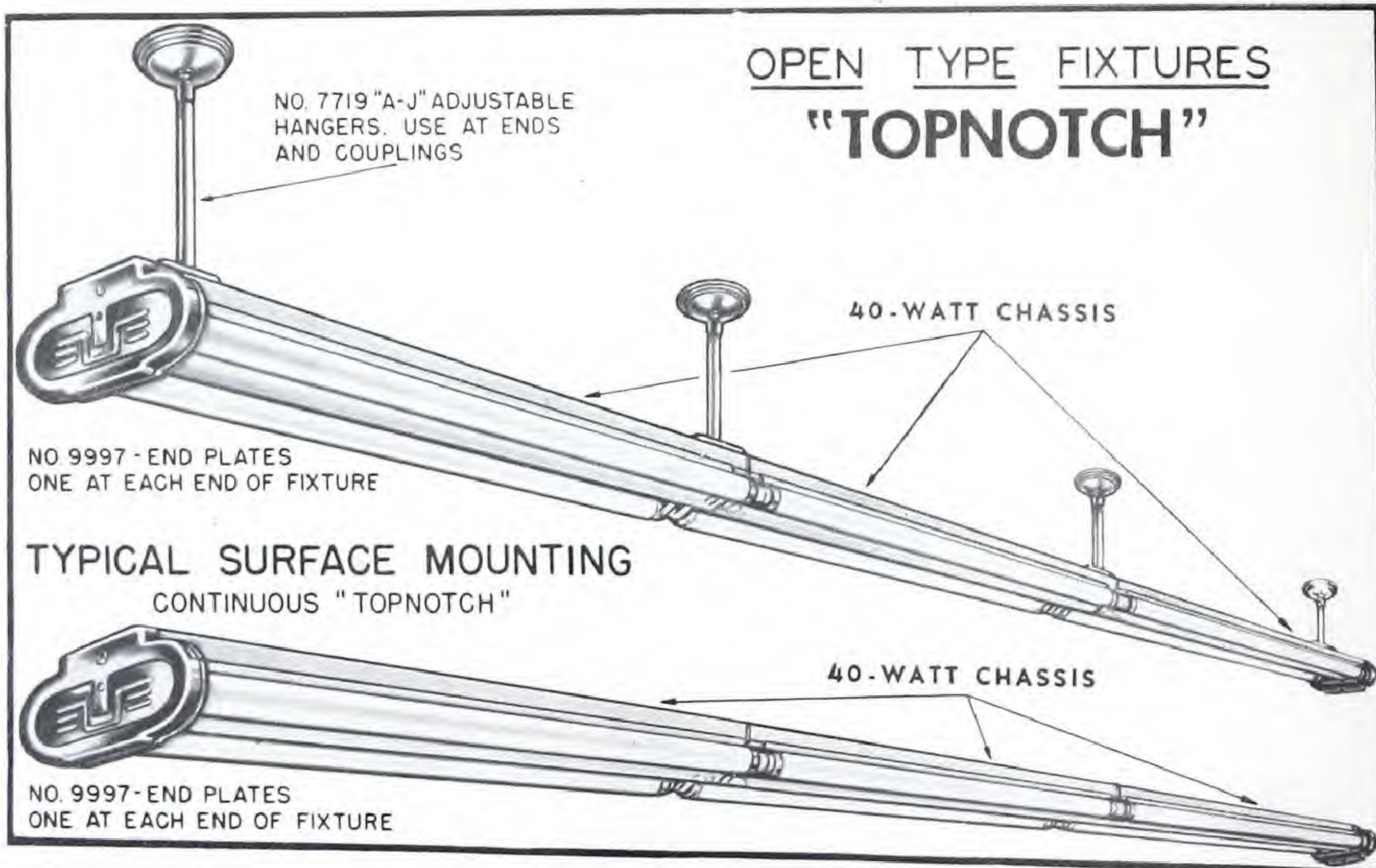
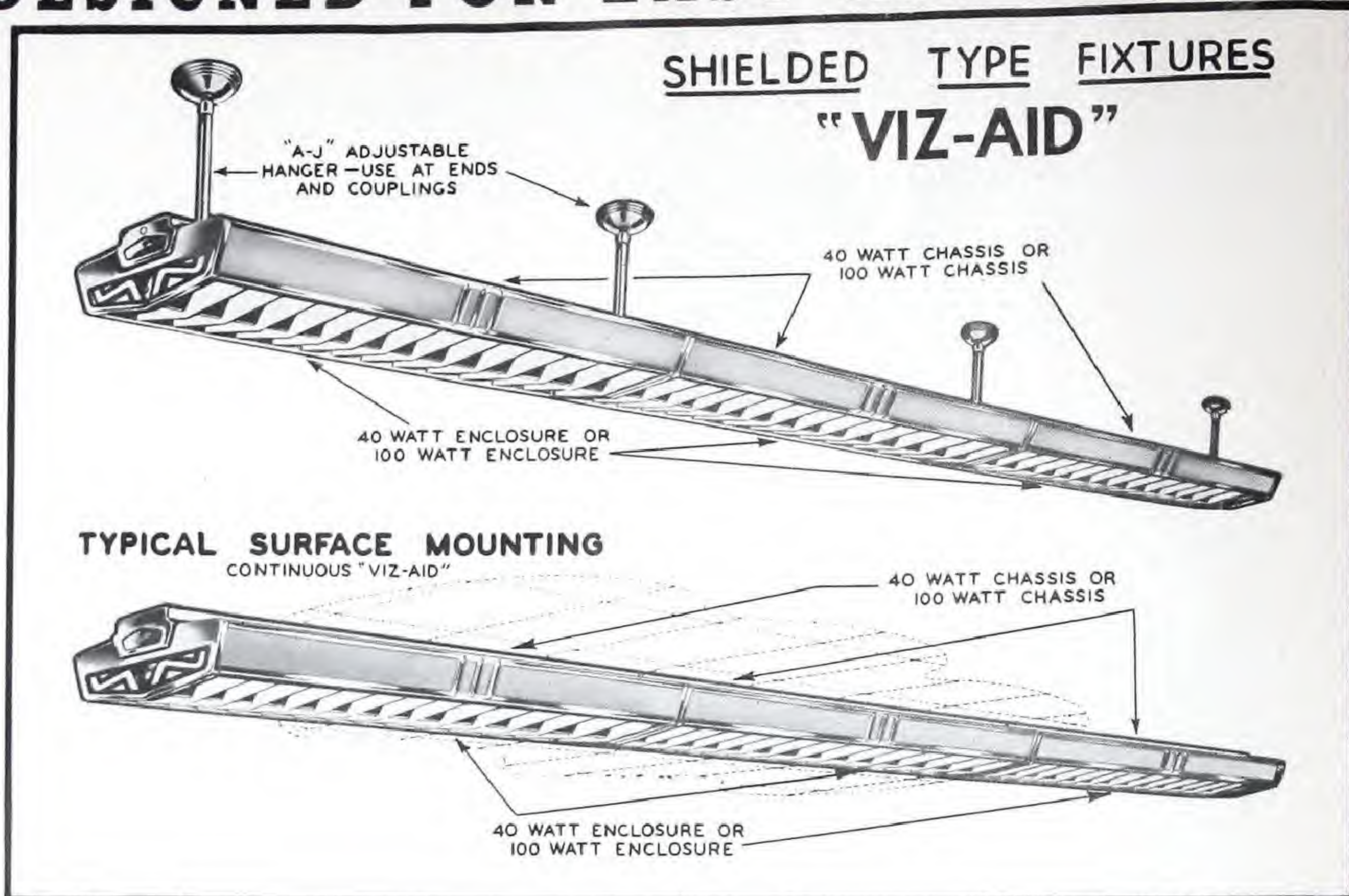
\*Assembled with fixture.

Fluorescent lamps are not included.

\*Assembled with fixture.



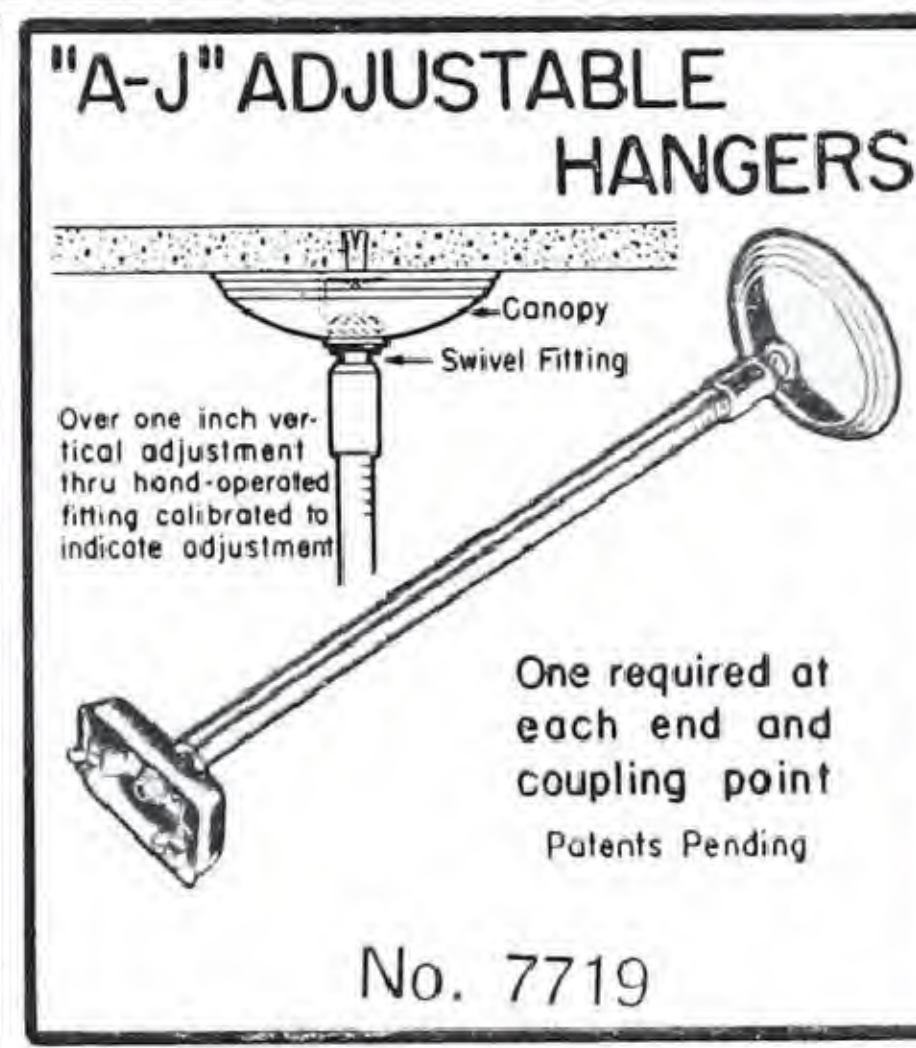
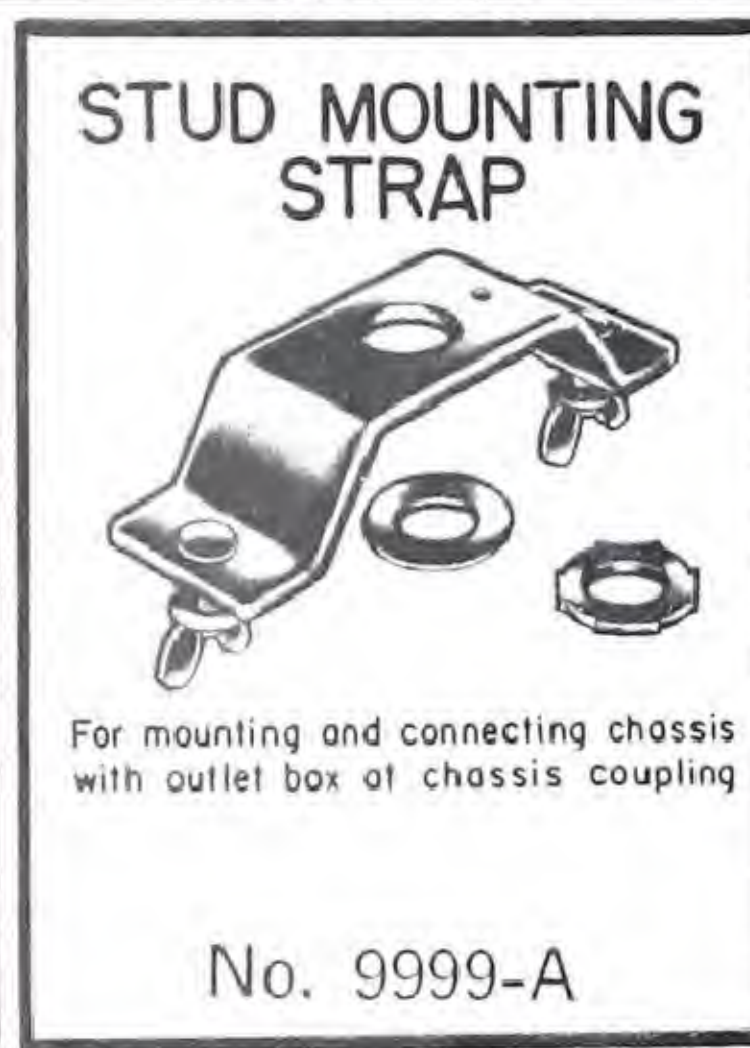
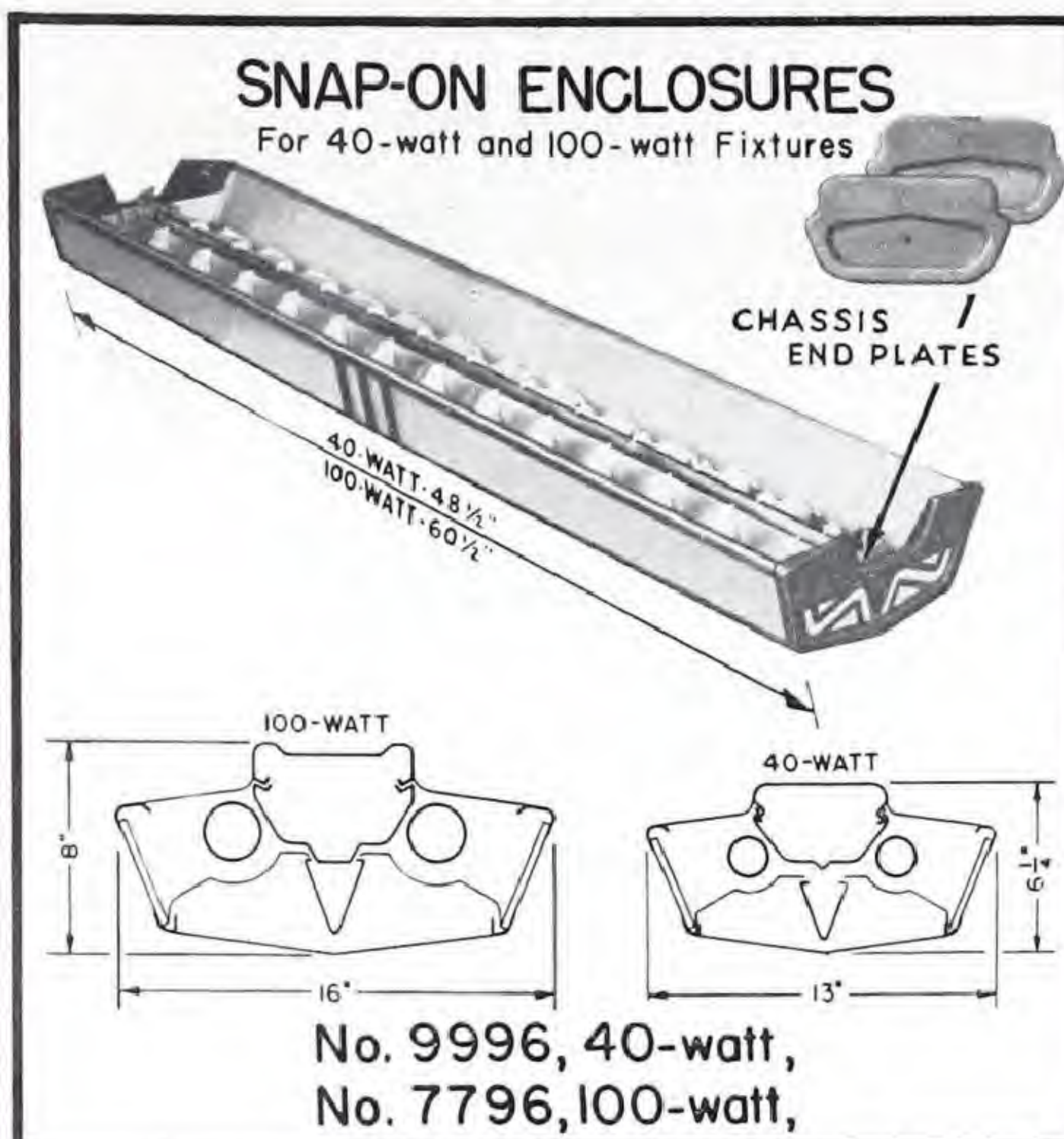
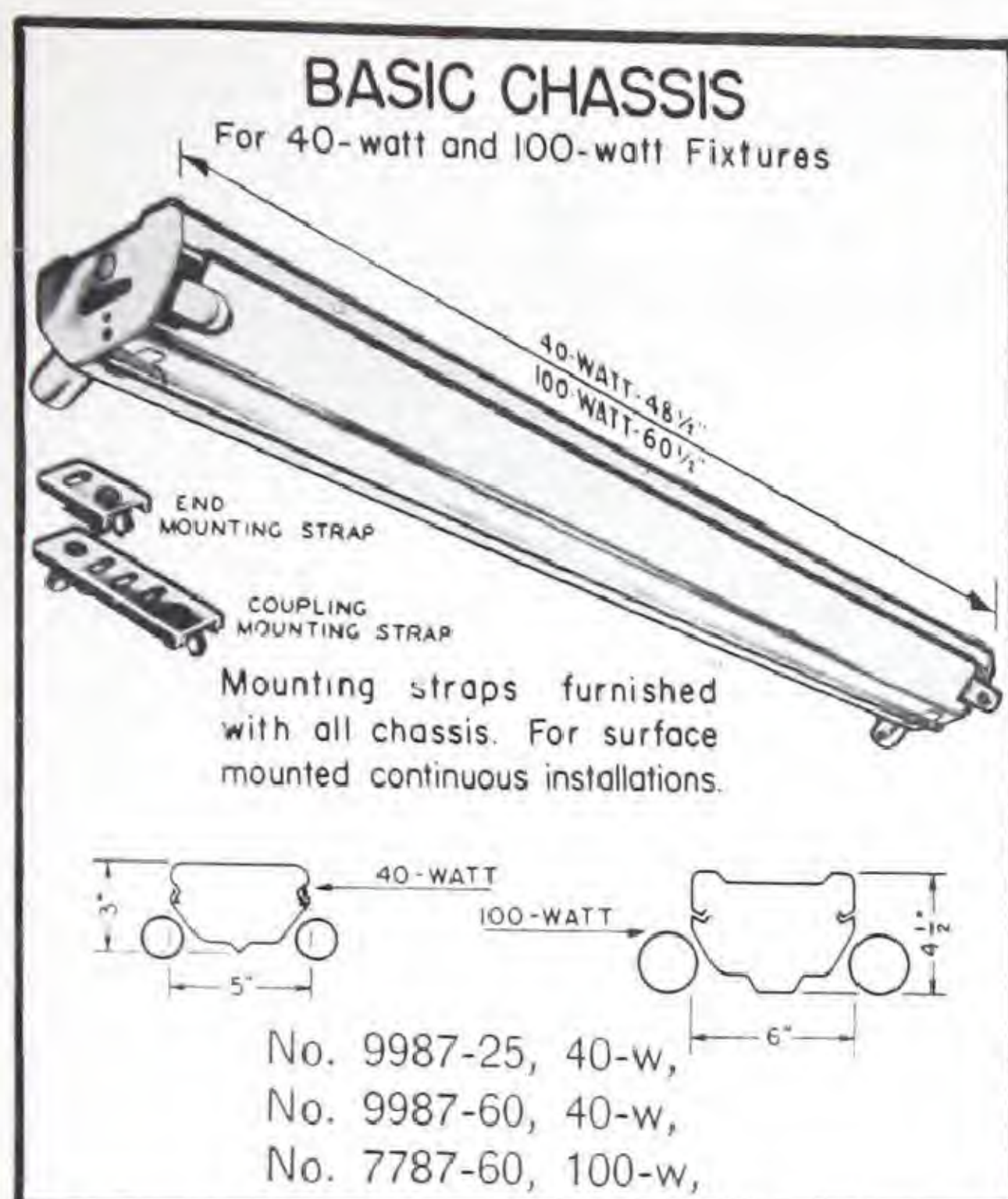
# DESIGNED FOR EASY ASSEMBLY . . .



Catalog No.	Description	Approx. Ship. Wgt.
7719	"A-J" Adjustable Hanger (length 28 1/2" maximum)	2 1/2 lbs.
7787-60	Basic Chassis wired for two 100-watt lamps (with NO-BLINK type starters)	35 lbs.
7796	Snap-on Enclosure for 100-watt fixtures	23 lbs.
9987-60	Basic Chassis for two 40-watt lamps (60 cycle)	20 lbs.
9987-25	Basic Chassis for two 40-watt lamps (25 cycle)	28 lbs.
9996	Snap-on Enclosure for "VIZ-AID" shielded fixtures	15 lbs.
9997	Decorative End Plates for "TOPNOTCH" open fixtures	1 1/2 lbs.
9999-A	Stud Mounting Strap (Std. Pkg. 10; less than 10, 44c)	1/2 lb.



# ... OF CONTINUOUS INSTALLATIONS



These basic parts are used for continuous shielded or exposed lamp, surface or suspension units.

**Basic Chassis**—No. 9987 accommodates two 40-watt lamps; No. 7787 accommodates two 100-watt lamps. All basic chassis are furnished wired with starters, sockets and high power factor ballasts. They are arranged for surface or suspension mounting, with all provisions for complete installations. Finish, baked SUPER-WHITE enamel.

**Snap-on Enclosure**—No. 9996 for the 40-watt unit or No. 7796 for the 100-watt unit. For shielded type fixtures, the enclosure snaps into place on the chassis. Frame is finished in baked lustre aluminum enamel, with the lateral louvres in baked SUPER-WHITE enamel. The V-shaped centre louvre is specular Alzak finish, engineered to provide additional light output in the useful area of illumination. Service chains support en-

closure to chassis, allowing free access for servicing operations. Two ornamental chassis end plates are included with each enclosure. End plates are attached to the chassis by means of a single screw which is shipped with the end plate. Each continuous row assembly requires two end plates only. One at each end of the run.

**End Plates**—No. 9997. For open type installations, one of these end plates is used on each end of the run. They are finished in baked lustre aluminum enamel.

**Hangers**—No. 7719. "A-J" Adjustable Hangers provide over one inch of vertical adjustment through hand-operated fittings. Stems are calibrated to indicate adjustment up or down. Finished in baked lustre aluminum enamel and include all parts for complete installation.

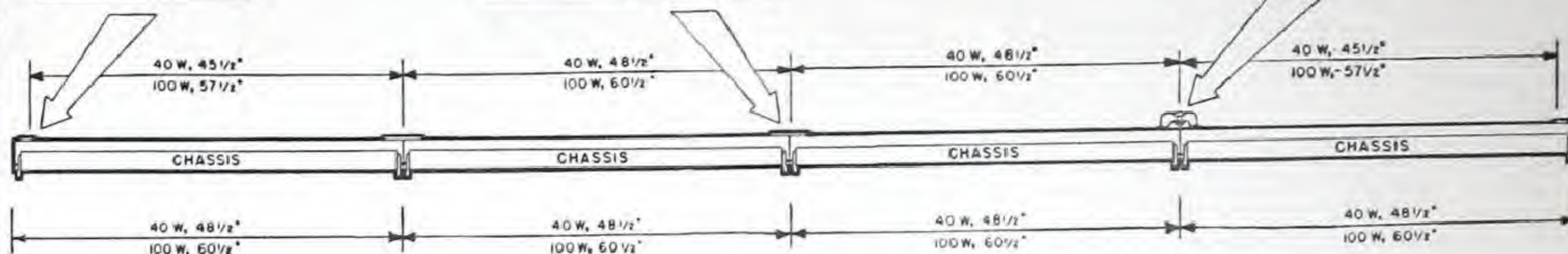
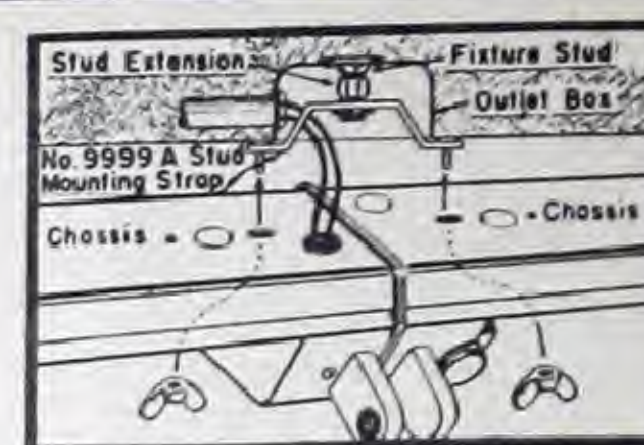
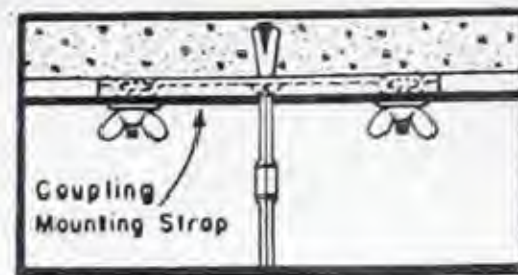


# CONTINUOUS INSTALLATION DATA

## SURFACE MOUNTING . . .

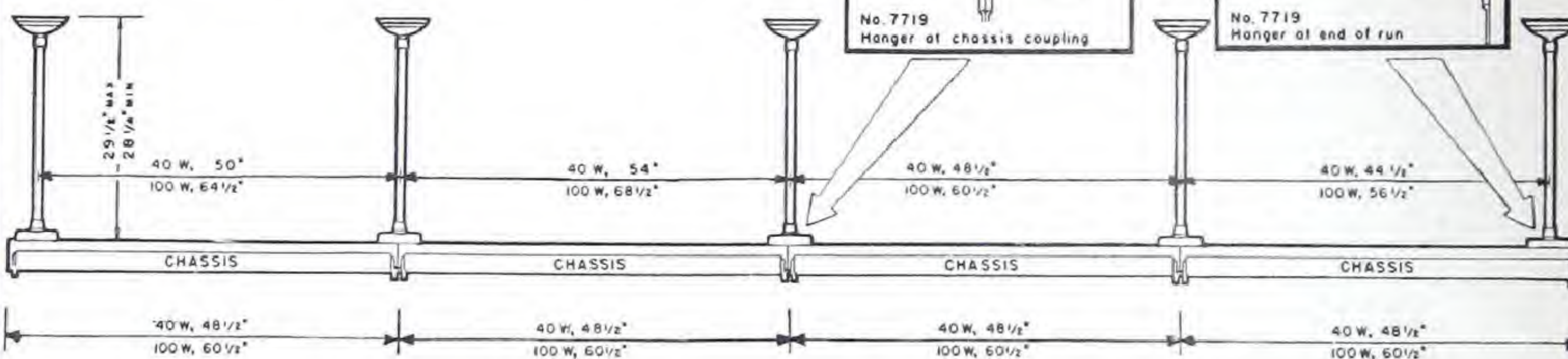


MOUNTING STRAPS INCLUDED WITH ALL CHASSIS



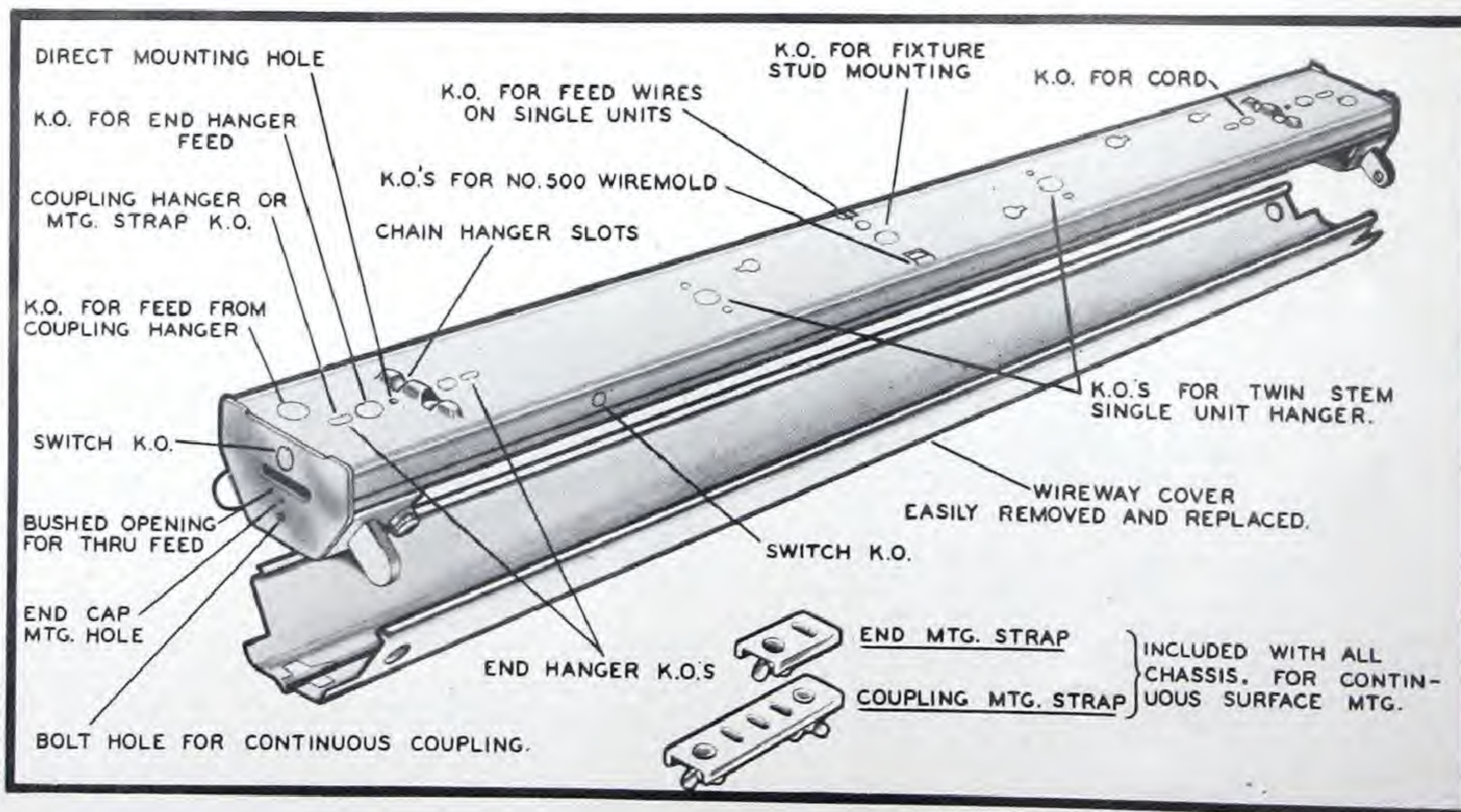
## SUSPENSION MOUNTING . . .

ORDER NO. 7719 "A-J" HANGERS AS REQUIRED



ADD END PLATES ENCLOSURES TO ABOVE AS REQUIRED

## BASIC CHASSIS Incorporating unusual installation and maintenance features





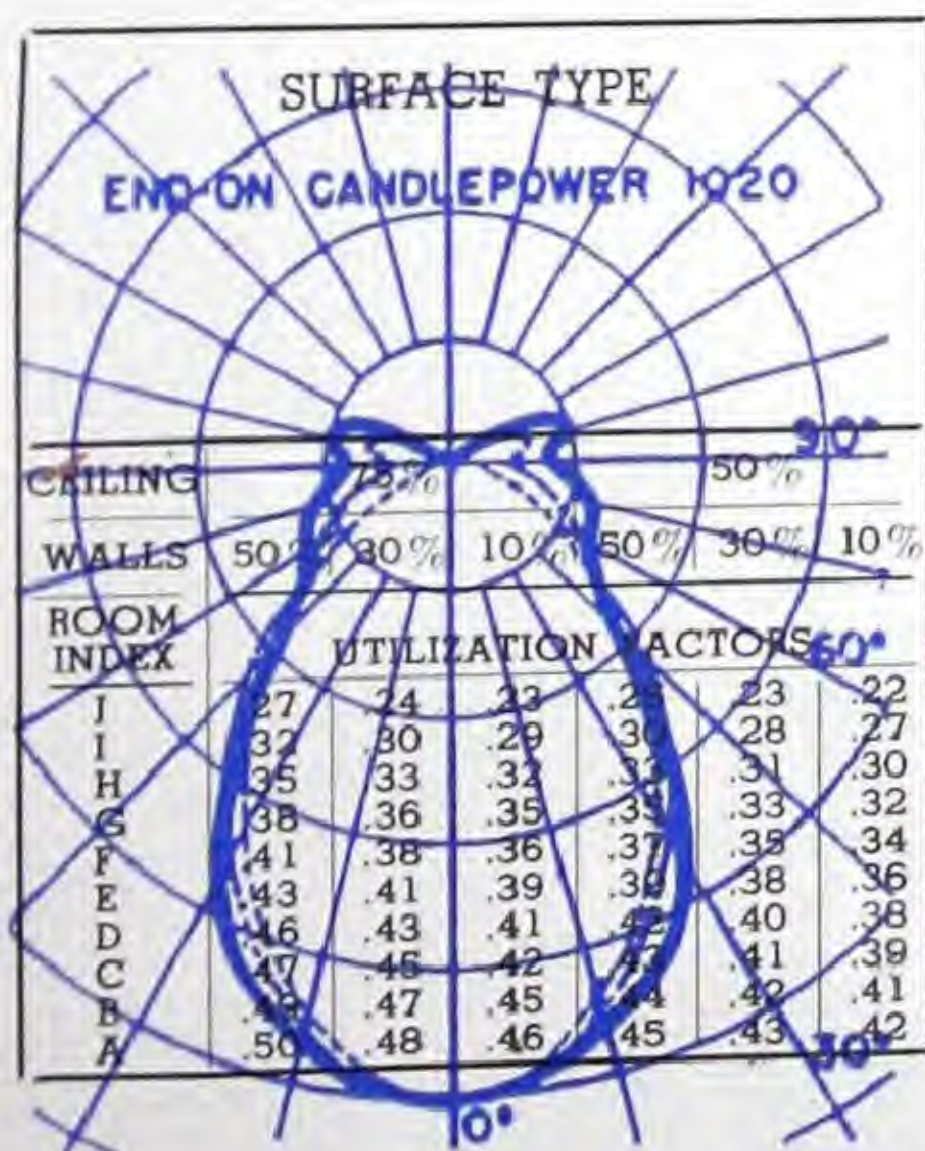
# FIGURING FOOTCANDLE INTENSITIES

## "VIZ-AID" 40-WATT INSTALLATIONS

INSTALLATION CONDITIONS (APPROXIMATE)				LARGE ROOM Width 4 Times Height		MEDIUM ROOM Width 2 Times Height		SMALL ROOM Width Equals Height	
MOUNTING HEIGHT (Feet)	FIXTURE SPACING (Feet)	AREA PER UNIT (Sq. Ft.)	WALLS AND CEILING	SURFACE TYPE	SUSPENSION TYPE	SURFACE TYPE	SUSPENSION TYPE	SURFACE TYPE	SUSPENSION TYPE
INDIVIDUAL UNIT INSTALLATIONS				APPROXIMATE FOOTCANDLES (Depreciated 25%)					
8-10	6 x 6	36	LIGHT MEDIUM DARK	44 40 37	50 45 41	38 34 32	41 37 34	31 28 26	33 30 27
8-10	7 x 7	49	LIGHT MEDIUM DARK	32 30 27	37 33 30	28 25 23	30 27 25	23 20 18	25 22 20
8-10	8 x 8	64	LIGHT MEDIUM DARK	25 23 21	28 26 23	21 19 18	23 21 19	17 16 15	19 17 15
9-11	9 x 9	81	LIGHT MEDIUM DARK	19 18 16	22 20 18	17 15 14	18 16 15	14 12 12	15 13 12
10-12	10 x 10	100	LIGHT MEDIUM DARK	16 14 13	18 16 15	13 12 11	15 13 12	11 10 9	12 11 10
CONTINUOUS INSTALLATIONS				APPROXIMATE FOOTCANDLES (Depreciated 25%)					
8-10	4	16.16	LIGHT MEDIUM DARK	98 91 83	112 102 92	85 77 67	93 83 77	69 63 59	75 67 61
8-10	5	20.20	LIGHT MEDIUM DARK	79 72 66	90 82 74	68 61 57	74 66 61	55 50 47	60 54 49
9-11	6	24.24	LIGHT MEDIUM DARK	65 60 55	75 68 62	57 51 47	62 55 51	46 42 39	50 45 40
9-11	7	28.28	LIGHT MEDIUM DARK	56 52 47	64 58 53	48 44 40	53 47 44	40 36 34	43 38 35
9-11	8	32.32	LIGHT MEDIUM DARK	49 45 41	56 51 46	42 38 36	46 42 38	34 31 30	37 33 30
10-14	9	36.36	LIGHT MEDIUM DARK	44 40 37	50 46 41	38 34 32	41 37 34	31 28 26	33 30 27
12-14	10	40.40	LIGHT MEDIUM DARK	40 36 33	45 41 37	34 31 28	37 33 31	28 25 24	30 27 25

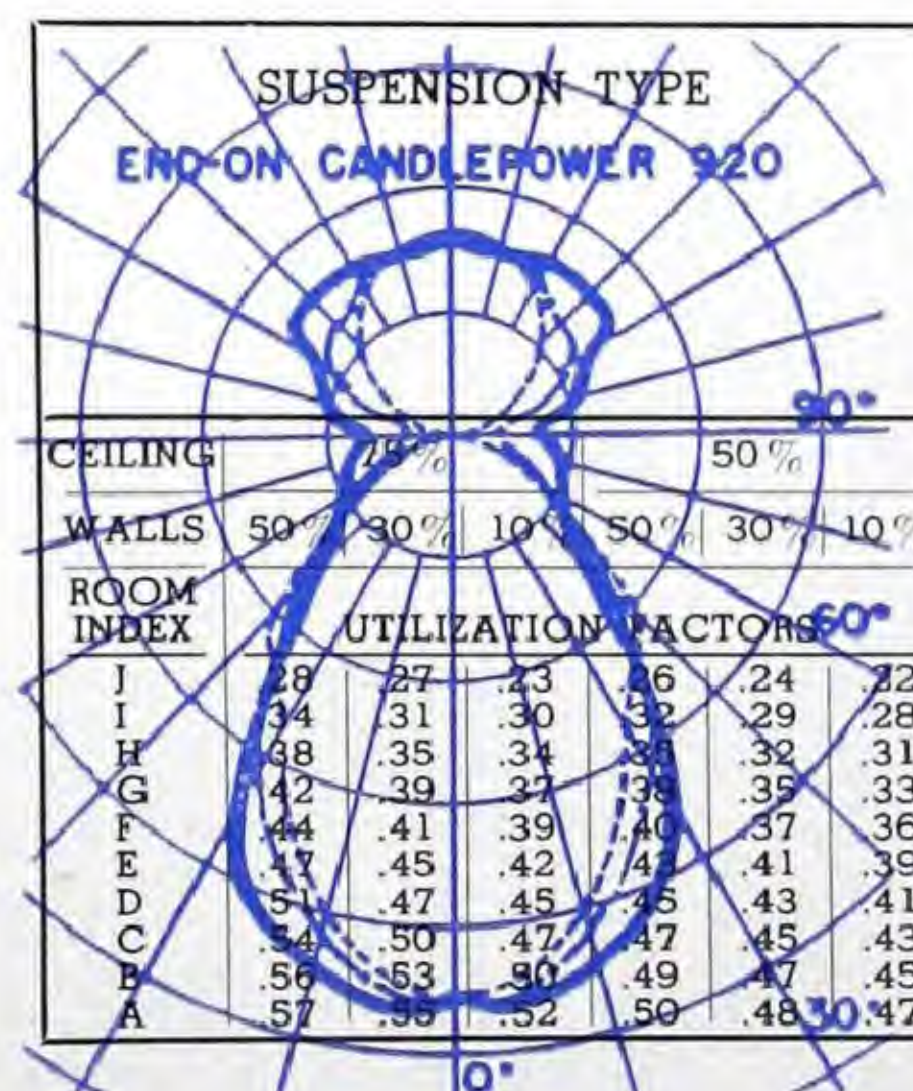
40-watt  
Single Units

40-watt  
Continuous



**SINGLE UNIT INSTALLATIONS**  
(Surface Type)  
For small offices, etc. Readings taken directly under centre of unit.

Distance from Unit to Working Plane	APPROXIMATE FOOTCANDLES	
	Under 5-ft. Unit	Under 8-ft. Unit
4 ft.	40	53
5 ft.	28	42
6 ft.	21	33
7 ft.	16	26
8 ft.	13	21
9 ft.	10	18
10 ft.	8	15



NOTE—All values figured are for WHITE lamps, based on 2100 lumen output.

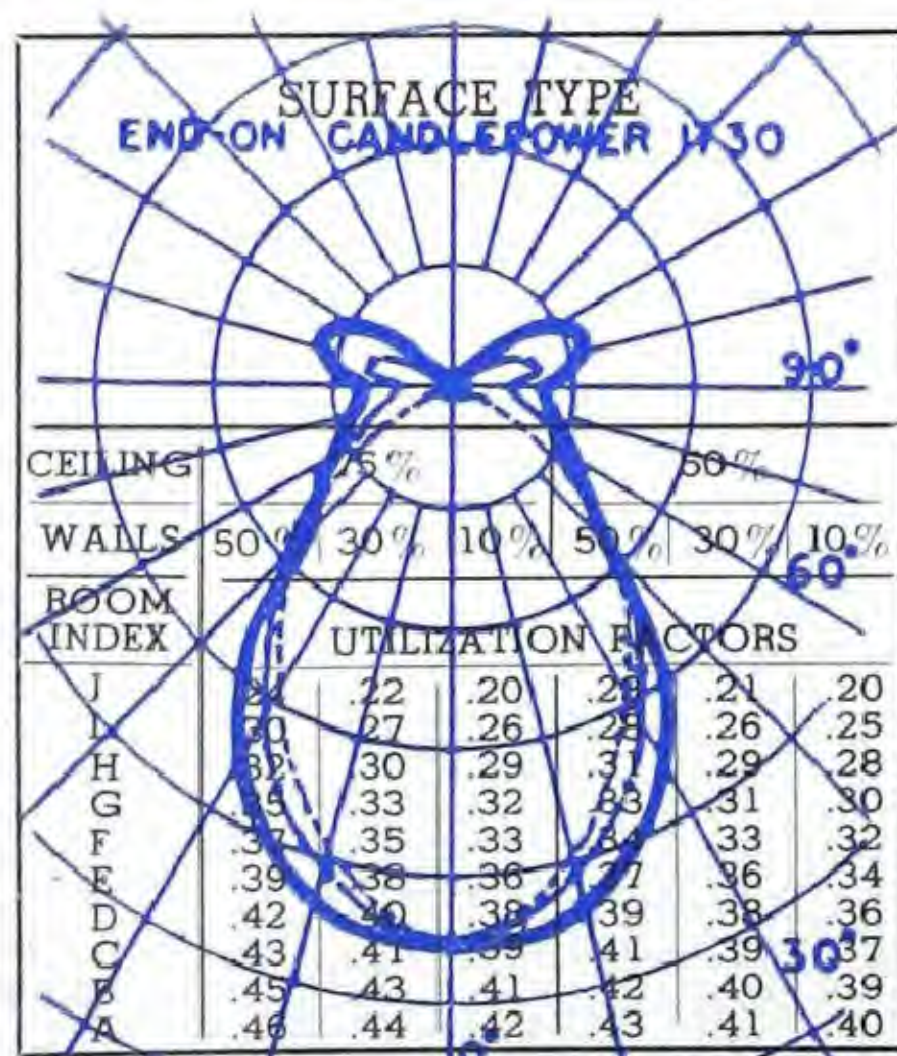


# FIGURING FOOTCANDLE INTENSITIES "VIZ-AID" 100-WATT INSTALLATIONS

INSTALLATION CONDITIONS (APPROXIMATE)				LARGE ROOM Width 4 Times Height		MEDIUM ROOM Width 2 Times Height		SMALL ROOM Width Equals Height	
MOUNTING HEIGHT (Feet)	FIXTURE SPACING (Feet)	AREA PER UNIT (Sq. Ft.)	WALLS AND CEILING	SURFACE TYPE	SUSPEN- SION TYPE	SURFACE TYPE	SUSPEN- SION TYPE	SURFACE TYPE	SUSPEN- SION TYPE
<b>INDIVIDUAL UNIT INSTALLATIONS</b>				<b>APPROXIMATE FOOTCANDLES (Depreciated 25%)</b>					
8-10	6 x 6	36	LIGHT MEDIUM DARK	81 74 70	91 84 74	68 63 59	77 68 61	56 51 49	61 52 49
8-10	7 x 7	49	LIGHT MEDIUM DARK	59 54 51	67 62 54	50 46 44	57 48 44	41 37 36	45 39 36
8-10	8 x 8	64	LIGHT MEDIUM DARK	45 41 39	51 47 41	38 35 33	43 38 33	31 29 27	34 29 27
9-11	9 x 9	81	LIGHT MEDIUM DARK	36 33 31	41 37 33	30 27 25	34 30 27	23 22 22	27 23 22
10-12	10 x 10	100	LIGHT MEDIUM DARK	29 26 25	33 30 26	25 23 21	28 25 22	20 18 18	22 19 18
<b>CONTINUOUS INSTALLATIONS</b>				<b>APPROXIMATE FOOTCANDLES (Depreciated 25%)</b>					
8-10	5	25.20	LIGHT MEDIUM DARK	115 105 100	130 112 105	98 90 85	110 98 88	80 73 70	88 75 70
9-11	6	30.24	LIGHT MEDIUM DARK	96 88 83	108 100 88	81 75 71	92 81 73	67 60 58	73 63 58
9-11	7	35.28	LIGHT MEDIUM DARK	82 75 71	92 86 75	70 64 61	79 70 62	57 52 50	62 54 50
9-11	8	40.32	LIGHT MEDIUM DARK	72 66 62	80 75 66	61 56 53	69 61 55	55 44 44	55 47 44
10-14	9	45.36	LIGHT MEDIUM DARK	64 58 56	71 67 58	54 50 47	61 54 49	44 40 39	49 42 39
12-14	10	50.40	LIGHT MEDIUM DARK	58 53 50	65 60 53	49 45 43	55 49 44	40 36 35	44 38 35
12-14	11	55.44	LIGHT MEDIUM DARK	52 48 46	59 55 48	44 41 39	50 44 40	36 33 32	40 34 32

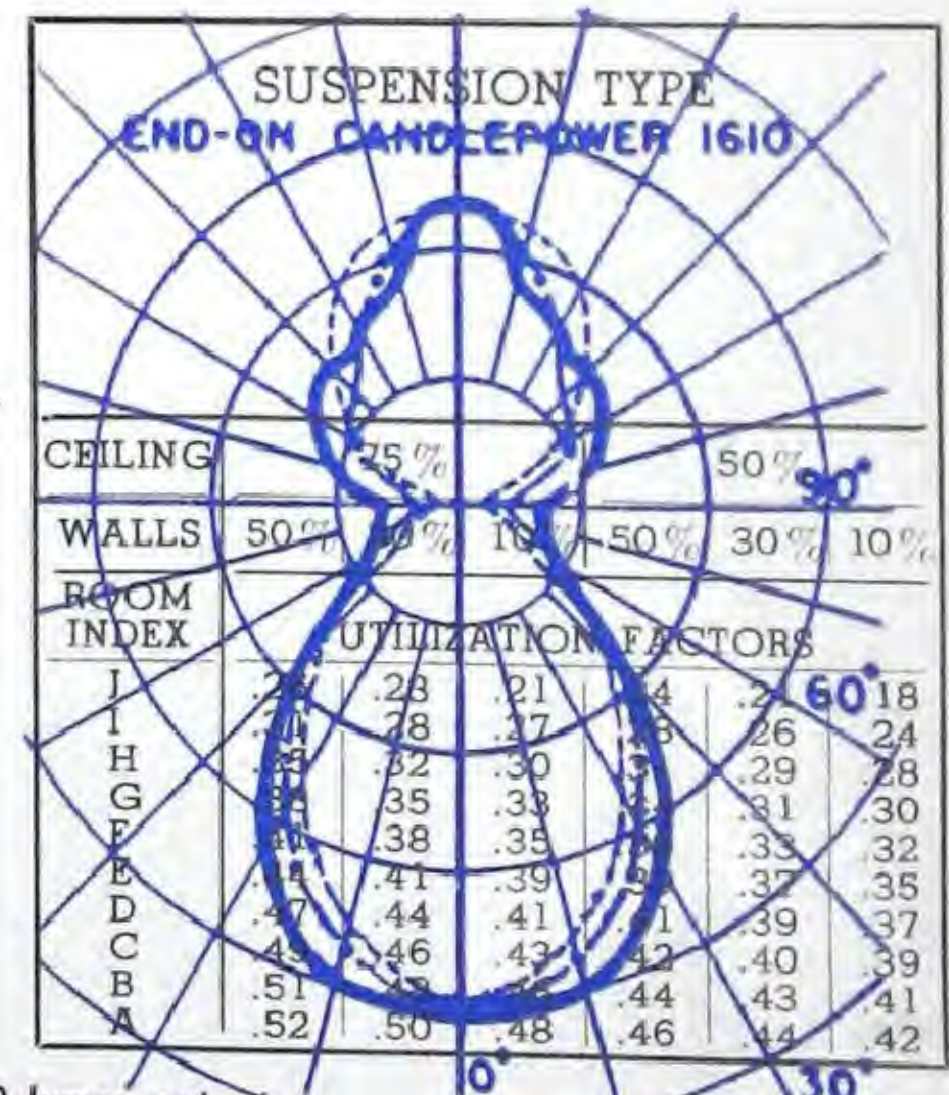
*100-watt  
Single Units*

*100-watt  
Continuous*



**SINGLE UNIT INSTALLATIONS**  
(Surface Type)  
For small offices, etc. Readings taken directly under centre of unit.

Distance from Unit to Working Plane	APPROXIMATE FOOTCANDLES	
	Under 5-ft. Unit	Under 10-ft. Unit
4 ft.	69	82
5 ft.	46	68
6 ft.	33	54
7 ft.	27	46
8 ft.	21	39
9 ft.	16	31
10 ft.	13	25



NOTE—All values figured are for WHITE lamps, based on 4200 lumen output.

## Northern Electric

COMPANY LIMITED

HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
PORT ARTHUR WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA





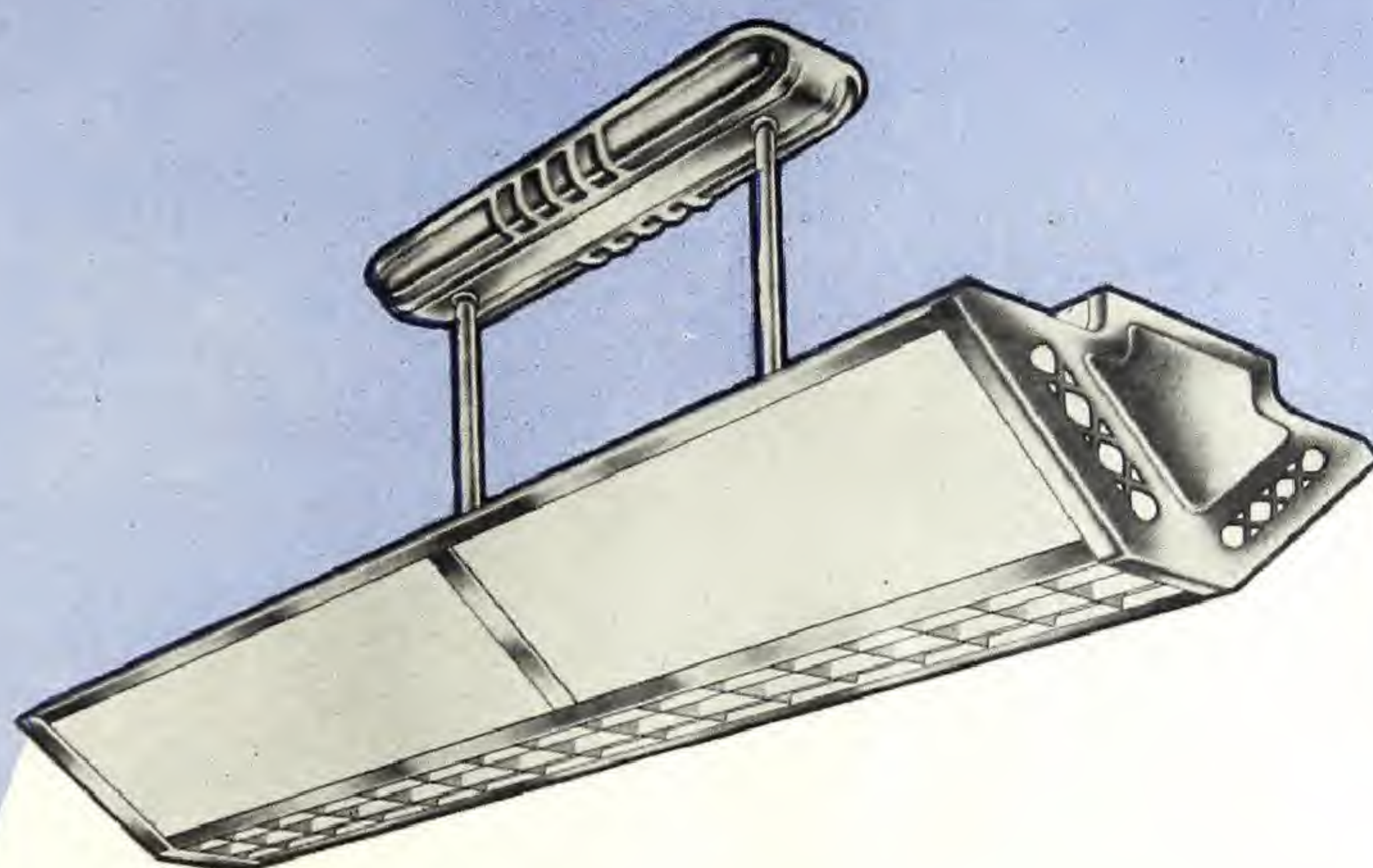
SEPTEMBER, 1946 L-4-6

NOR-ELECTRIC



BULLETIN

# *Day Brite*



## **CORONADO**

*and*

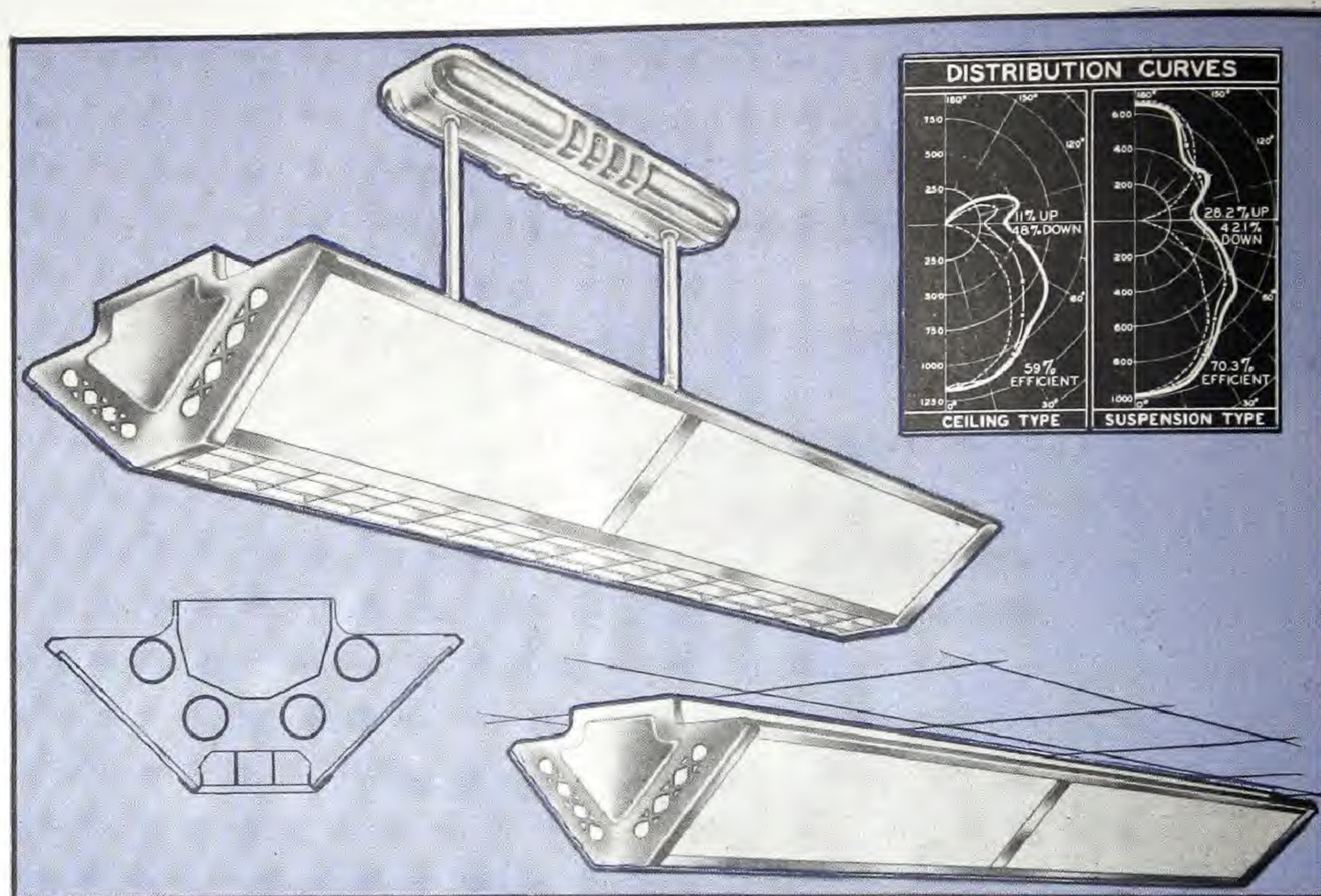
## **PARKWAY**

COMMERCIAL FLUORESCENT LIGHTING UNITS



# The CORONADO

FOR FOUR 40-WATT LAMPS



These fixtures are suitable for either ceiling or suspension mounting for four 40-watt lamps.

The chassis or wiring channel is substantially constructed of steel and finished in baked SUPER-WHITE enamel, providing a diffuse, durable reflecting surface of high efficiency.

The enclosure frame and louvers are of steel . . . die-formed ends have cut-out design backed with diffuse plastic to provide a luminous end appearance. Baked lustre aluminum enamel is used for enclosure finish with louvers in baked SUPER-WHITE enamel. The side panels are of ribbed, diffuse glass.

The enclosure is held in place by spring clips and is easily installed and removed. A pair of

service chains is provided attached to the chassis so that the enclosure can be lowered and is supported for maintenance operations. Removing and installing the enclosure takes less than a minute . . . a permanent time saving feature in cleaning and relamping.

Hangers for suspension-type units include all necessary parts for complete installation. Finished in baked lustre aluminum enamel. Ceiling-type fixtures have a removable mounting plate for easy installation.

All fixtures are furnished wired and include sockets, starters and high power-factor ballasts for 110-125 volt, 60 cycle or 25 cycle A.C. operation.

For Lamps		Cycles	Catalogue No.	Dimensions				Approx. Shipping Weight
No.	Size			Body Length	Body Width	Body Height	Overall Height*	
For Direct Ceiling Mounting								
4	48"—40w—110v	60	46408-60	48 <sup>3</sup> / <sub>4</sub> "	15"	7"	....	46 lbs.
4	48"—40w—110v	25	46408-25	48 <sup>3</sup> / <sub>4</sub> "	15"	7"	....	57 lbs.
Hanger For Suspension Mounting								
..	.....	....	9925	....	....	27"	34"	6 lbs.

Fluorescent Lamps are not included

\*.....

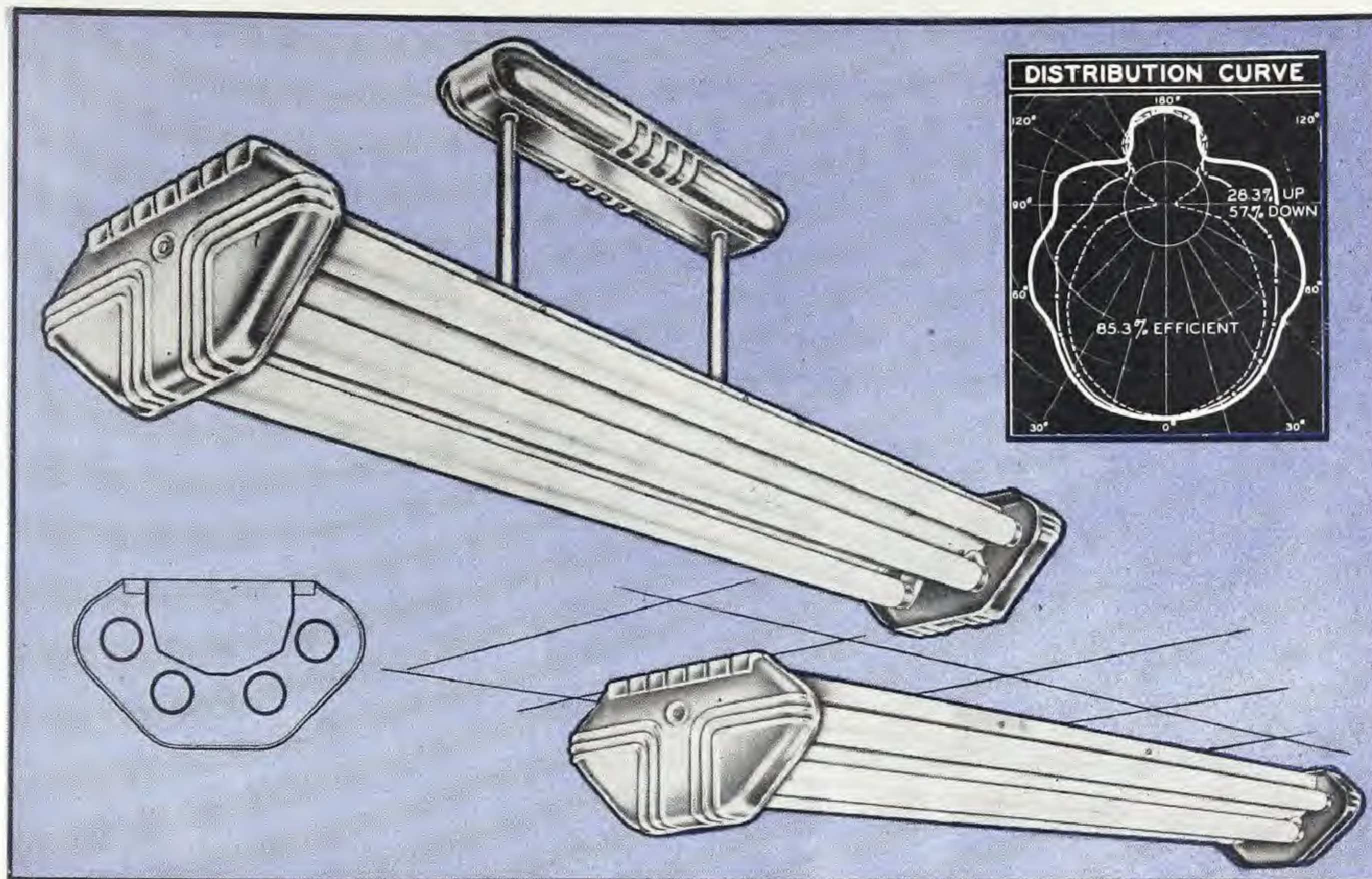
Fluorescent Lamps are not included.

\*Assembled with fixture.



# The PARKWAY

FOR FOUR 40-WATT LAMPS



These open-type fixtures are designed for lighting areas where inexpensive and efficient fixtures are required.

They are available in one size only . . . for four 40-watt lamps and are suitable for either ceiling or suspension mounting.

The chassis or wiring channel is substantially constructed of steel and finished in baked SUPER-WHITE enamel, providing a diffuse, durable reflecting surface of high efficiency. The end caps are of die-formed steel, deeply embossed with an attractive modern design. They have a rich baked lustre aluminum finish that blends well with all modern interiors.

Designed for easy servicing . . . lamps can be removed and replaced without disturbing end caps.

Suspension-type fixtures include complete hanger assembly consisting of ceiling strap, stems, swivel fitting, two lengths of wire, stamped canopy and all locknuts and fittings necessary for complete installation. Finished in baked lustre aluminum enamel. Ceiling-type fixtures have removable mounting plate for easy installation.

All fixtures are furnished wired and include sockets, starters and high power-factor ballasts for 110-125 volt, 60 cycle or 25 cycle A.C. operation.

For Lamps		Cycles	Catalogue No.	Dimensions				Approx. Shipping Weight
No.	Size			Body Length	Body Width	Body Height	Overall Height*	
For Direct Ceiling Mounting								
4	48"—40w—110v	60	46406-60	48¾"	11"	6¼"	....	28 lbs.
4	48"—40w—110v	25	46406-25	48¾"	11"	6¼"	....	40 lbs.
Hanger For Suspension Mounting								
..	.....	....	9925	....	....	27"	33¼"	6 lbs.

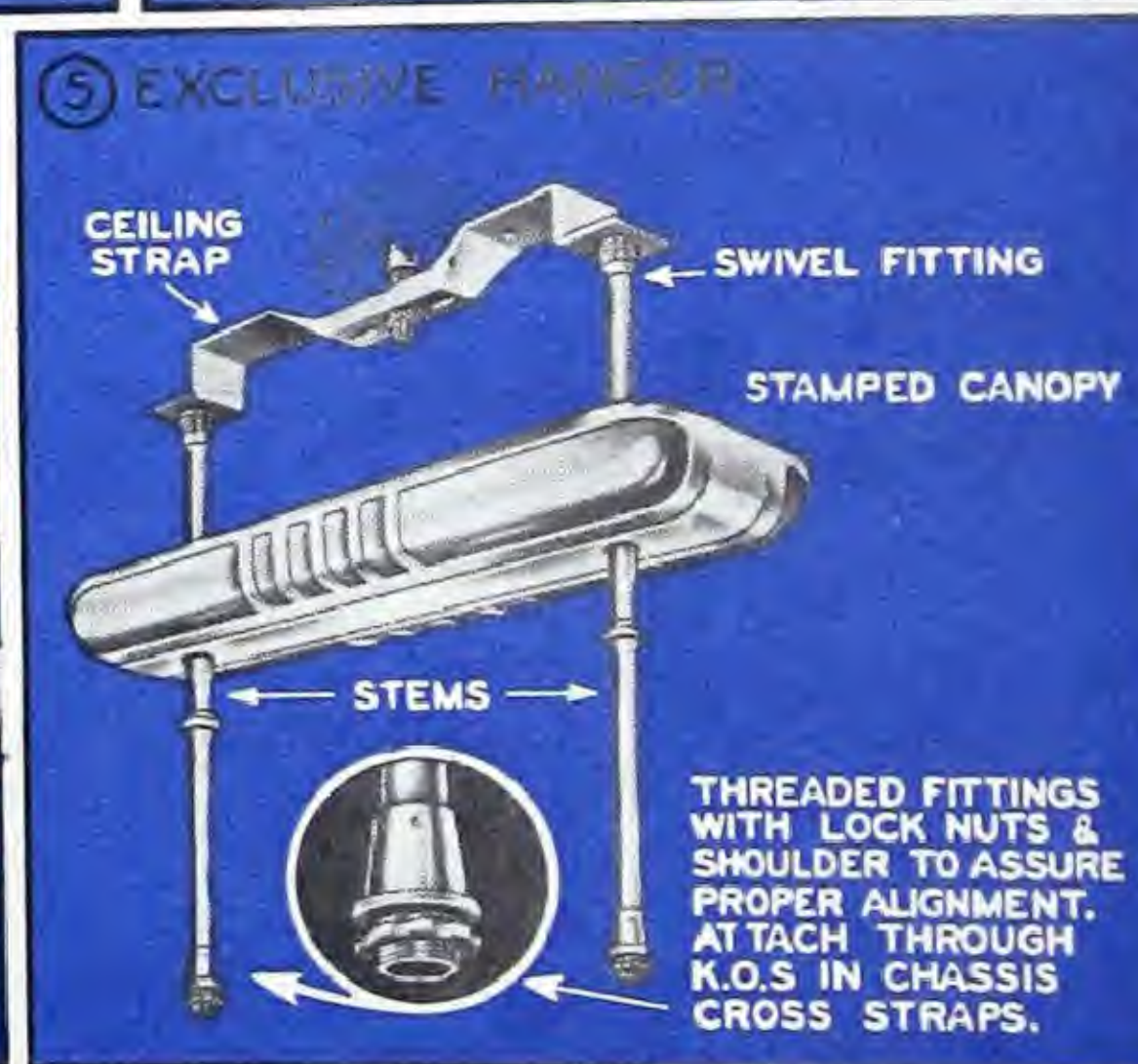
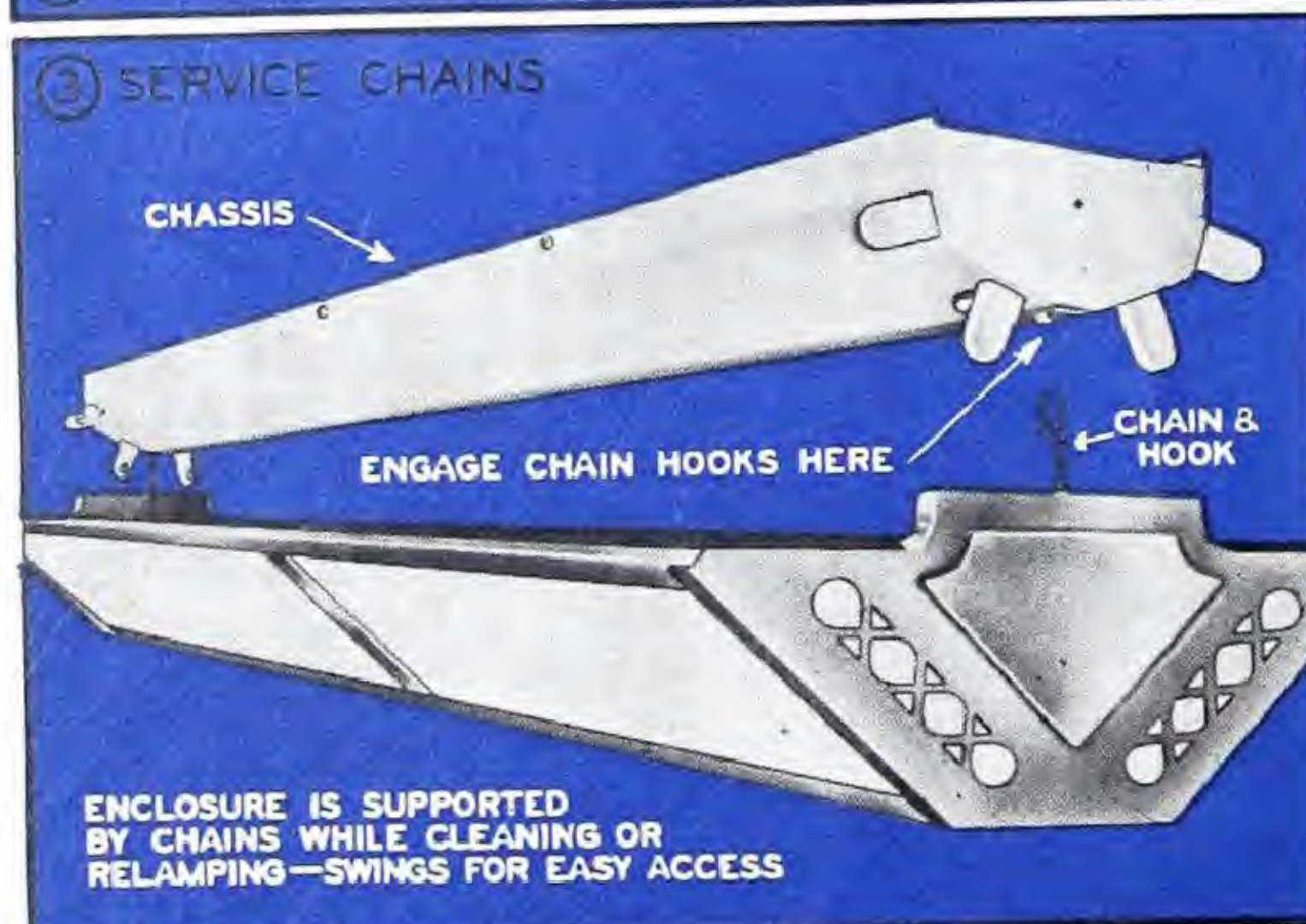
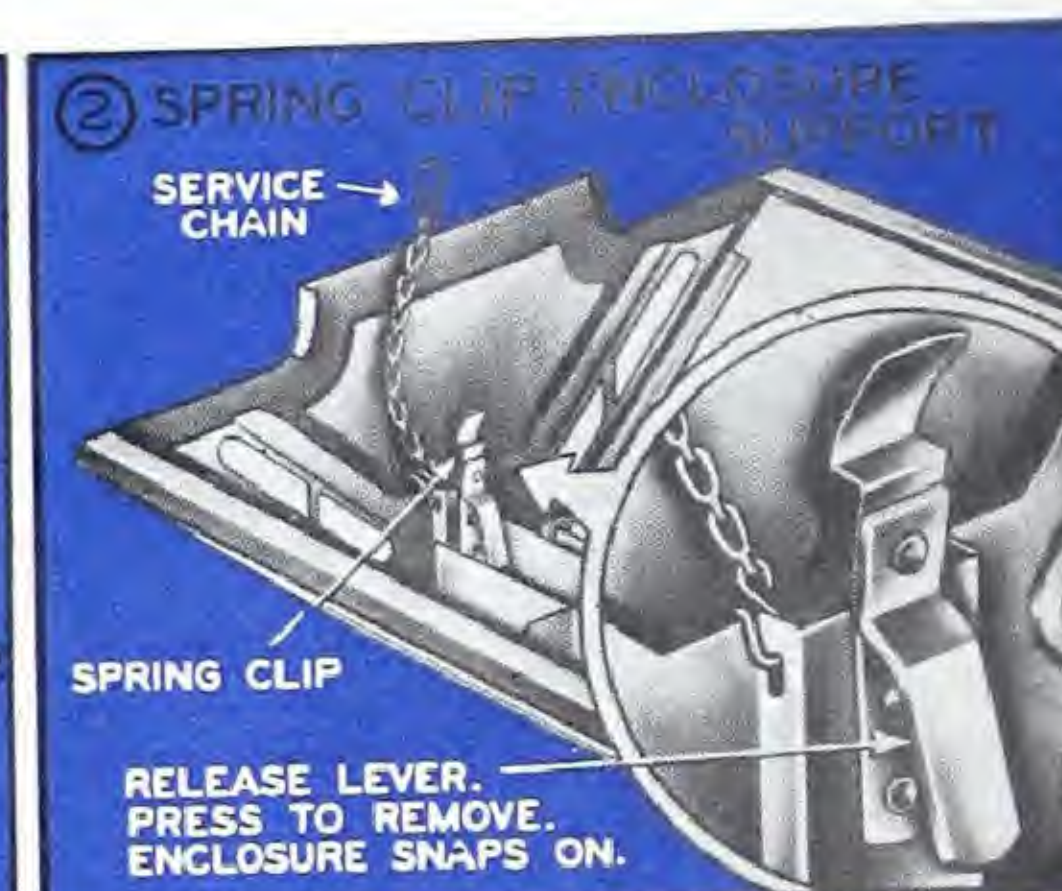
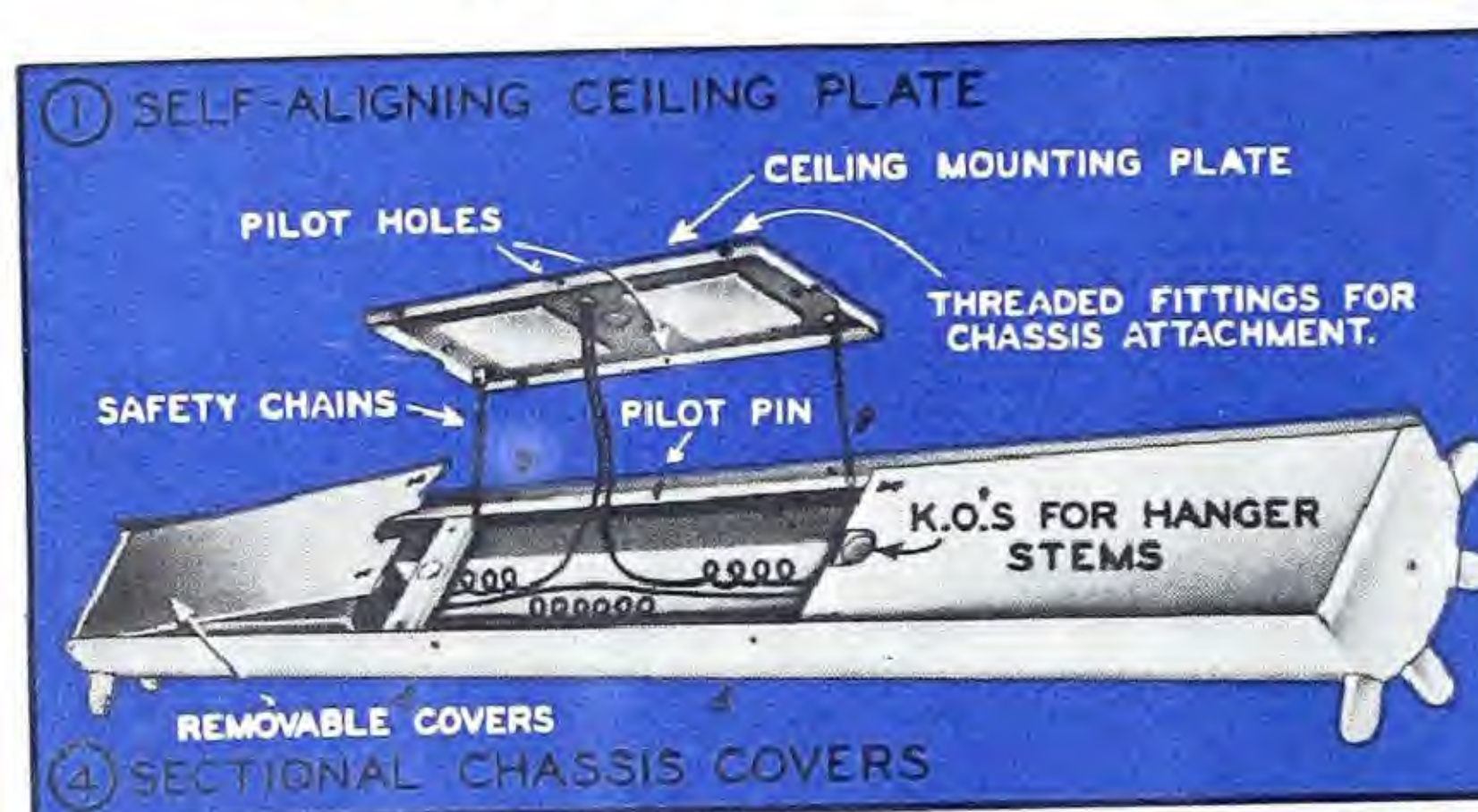
Fluorescent Lamps are not included.

\*Assembled with unit.



## Exclusive Installation and Servicing Features

- 1 **SELF-ALIGNING CEILING PLATES** HAVE SAFETY CHAINS FOR EASY INSTALLATION.
- 2 **SPRING CLIP** SUPPORT MAKES CORONADO ENCLOSURE INSTALLATION SIMPLE AND SPEEDY.
- 3 **SERVICE CHAINS** ON CORONADO ENCLOSURES SPEED MAINTENANCE OPERATIONS.
- 4 **SECTIONAL CHASSIS COVERS** PROVIDE EASY ACCESS TO INTERIOR OF FIXTURE.
- 5 **EXCLUSIVE HANGER DESIGN & CONSTRUCTION** WITH NEW FEATURES TO CUT INSTALLATION COSTS.
- 6 **EXCLUSIVE DAY-BRITE DESIGNS** — BEAUTY AND STABILITY IN PLEASING COMBINATION.
- 7 **LOWEST COST MAINTENANCE** — SPEED AND SIMPLICITY OF ALL OPERATIONS.



Coronado and Parkway units are Approved by the Canadian Standards Association.

# Northern Electric

COMPANY LIMITED

HALIFAX	MONCTON	QUEBEC	CHICOUTIMI	THREE RIVERS	SHERBROOKE	MONTREAL	OTTAWA
VAL D'OR	TORONTO	HAMILTON	LONDON	WINDSOR	KIRKLAND LAKE	TIMMINS	SUDBURY
PORT ARTHUR	WINNIPEG	REGINA	LETHBRIDGE	CALGARY	EDMONTON	VERNON	VANCOUVER VICTORIA





NOVEMBER, 1950 **L-5-1**  
REPLACES L-5-7 and L-5-3

NOR-ELECTRIC



BULLETIN

ILLUMINATION DEPARTMENT



GLASSWARE  
and HANGERS



# Lighting Glassware

Catalogue Number	Diameter	Depth	Fitter	Lamp Watts	St. Pkg.	Approx. Lbs. Per Pkg.
816660	9 $\frac{1}{4}$ "	6 $\frac{9}{16}$ "	4"	60	8	20
816670	12 $\frac{1}{4}$ "	8 $\frac{3}{16}$ "	6"	100	2	9
816680	14 $\frac{1}{4}$ "	9 $\frac{3}{4}$ "	6"	150	2	12
816690	16 $\frac{1}{4}$ "	10 $\frac{5}{8}$ "	6"	200	2	16
816700	18 $\frac{1}{4}$ "	12 $\frac{7}{16}$ "	6"	300	1	12



"KEYSTONE"

Catalogue Number	Diameter	Depth	Fitter	Lamp Watts	St. Pkg.	Approx. Lbs. Per Pkg.
810619	8 $\frac{1}{2}$ "	5 $\frac{9}{16}$ "	4"	60	12	25
813160	10"	6 $\frac{1}{2}$ "	4"	60	8	20
813170	12"	7 $\frac{3}{4}$ "	6"	100	4	18
813180	12"	7 $\frac{3}{4}$ "	4"	100	4	18
813190	14"	9"	6"	150	3	17
813200	16"	10 $\frac{1}{4}$ "	6"	200	2	17
813220	18"	11 $\frac{3}{8}$ "	6"	300	1	13



"SEVILLE"

Catalogue Number	Diameter	Depth	Fitter	Std. Pkg.	Approx. Lbs. Per Pkg.
823200	6"	6"	3 $\frac{1}{4}$ "	24	26
823220	8"	8"	4"	12	24
800080	10"	10"	4"	8	26
800060	10"	10"	5"	8	26
800070	10"	10"	6"	8	26
800020	12"	12"	6"	2	12
800190	12"	12"	8"	2	12
800090	14"	14"	6"	1	10
800120	14"	14"	7"	1	10
800140	14"	14"	8"	1	10
800200	16"	16"	6"	1	14
800040	16"	16"	8"	1	14
800030	18"	18"	8"	1	14
800170	18"	18"	10"	1	19
800150	20"	20"	8 $\frac{1}{4}$ "	1	28



"BALL GLOBE"

Catalogue Number	Diameter	Depth	Fitter	Lamp Watts	St. Pkg.	Approx. Lbs. Per Pkg.
812980	10 $\frac{7}{16}$ "	8 $\frac{5}{16}$ "	4"	60	4	14
812990	12"	9 $\frac{3}{16}$ "	6"	100	2	11
813000	14"	10 $\frac{1}{2}$ "	6"	150	2	13
813010	16"	11 $\frac{3}{4}$ "	6"	200	2	15
813020	18"	13 $\frac{3}{16}$ "	6"	300	1	12



"PILGRIM"

Catalogue Number	Diameter	Depth	Fitter	Lamp Watts	Std. Pkg.	Approx. Lbs. Per Pkg.
12180LSB	16 $\frac{1}{4}$ "	8 $\frac{1}{2}$ "	6"	200-300	2	20
12180LSB	18 $\frac{1}{4}$ "	9 $\frac{1}{8}$ "	6"	300-500	2	20



"RANGER"

The Keystone, Seville, Pilgrim and Ball Globe Units are designed with special seared fitters as added protection against chipping.





1606-08-10



1508-12



1406-08-10



1706-08



1806-08



409

Catalogue Number	Diameter	Depth	Fitter	Std. Pkg.	Approx. Lbs. Per Pkg.
709	8 1/2"	6 1/2"	4"	12	25
1508	8 5/16"	6 3/8"	4"	12	31
1512	12"	8 5/16"	6"	2	18
409	8 3/8"	8"	4"	12	25
1908	8"	7 1/4"	4"	12	28
1706	6 1/2"	6 7/16"	4"	12	24
1708	6 1/2"	7"	4"	12	27
1806	6 1/2"	6 7/16"	4"	12	24
1808	8 1/2"	7"	4"	12	27
1406	6 3/8"	3 1/2"	6"	12	20
1408	8 3/8"	4"	8"	12	40
1410	10 3/8"	4 1/2"	10"	6	32
1606	6 3/8"	3 1/2"	6"	12	20
1608	8 3/8"	4"	8"	12	40
1610	10 3/8"	4 1/2"	10"	6	32



1908



709

Catalogue Number	Diameter	Depth	Fitter	Std. Pkg.	Approx. Lbs. Per Pkg.
820090	6"	4 13/16"	2 1/4"	12	12
820120	8"	5 3/4"	2 1/4"	12	19
824160	10"	5 3/8"	2 7/8"	12	28
160	10"	5 3/8"	2 7/8"	6	18



824160



820120



820090



160



## Safety Hangers

SCREWLESS TYPE HANGERS THAT ARE PERMANENTLY SAFE. THEY ELIMINATE THE DANGER OF FALLING GLASS DUE TO VIBRATION OR CRACKING AROUND THE NECK.

Catalogue Number	Lamp Socket	Overall Length	Fitter Dimension.	Finish
1174	Medium	30"	4"	Bronze, Brushed Chrome
1176	Medium	30"	6"	Bronze, Brushed Chrome
1176M	Mogul	30"	6"	Bronze, Brushed Chrome
1620	Medium	7"	4"	Bronze, Brushed Chrome
1621	Medium	7"	6"	Bronze, Brushed Chrome
1622	Mogul	7"	6"	Bronze, Brushed Chrome



1620-21-22



1174-76-76M

## Standard Hangers

ECONOMICAL SCREW-TYPE HANGERS AND CEILING BANDS, FOR ALL STANDARD LIGHTING APPLICATIONS.



1628-29



1714-15-24-24M

Catalogue Number	Lamp Socket	Overall Length	Fitter Dimension.	Finish
1178	Medium	30"	4"	Bronze, Brushed Chrome
1180	Medium	30"	6"	Bronze, Brushed Chrome
1180M	Mogul	30"	6"	Bronze, Brushed Chrome
1184	Medium	30"	4"	Bronze, Brushed Chrome
1186	Medium	30"	6"	Bronze, Brushed Chrome
1186M	Mogul	30"	6"	Bronze, Brushed Chrome
1714	Medium	2 1/2"	4"	Bronze, Brushed Chrome, White Enamel
*1715	Medium	2 1/2"	4"	Bronze, Brushed Chrome, White Enamel
1724	Medium	3"	6"	Bronze, Brushed Chrome
1724M	Mogul	3"	6"	Bronze, Brushed Chrome
1628	Medium	6 1/4"	6"	Bronze, Brushed Chrome
1629	Mogul	6 1/4"	6"	Bronze, Brushed Chrome

\*Pull Chain



1178-80-80M



1184-86-86M

# Northern Electric

COMPANY LIMITED

HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
 KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
 FORT WILLIAM WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA

7M-11-50





Revised October 1947 L-5-8

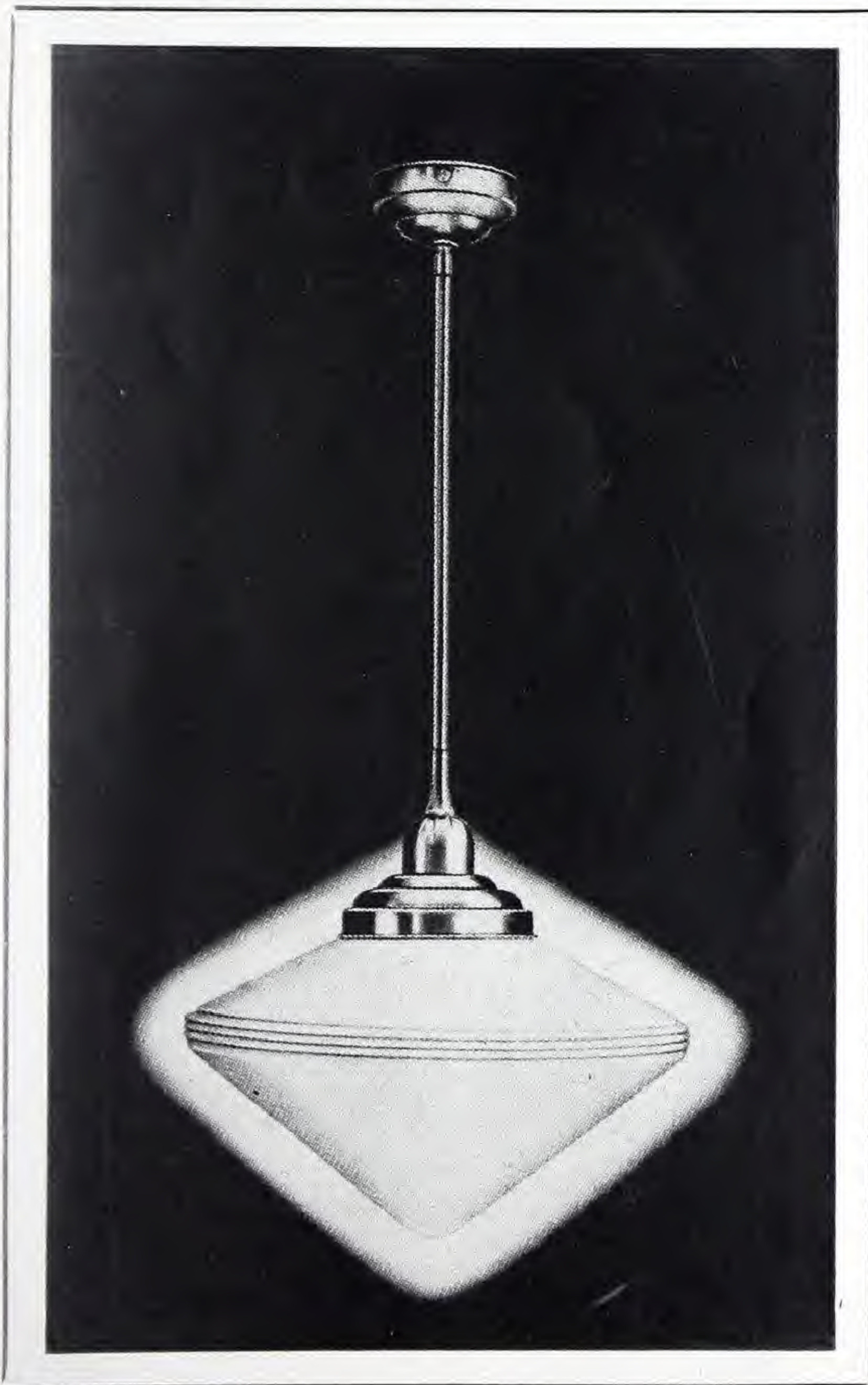
NOR-ELECTRIC



BULLETIN

## *"The Keystone"*

"THE KEYSTONE" is made from MONAX Brand glass of high efficiency for general diffuse lighting. Of smart "streamline" appearance, "THE KEYSTONE" will meet the popular demands of modern lighting. Provision has been made on the rim of each globe for use of a louvre if desired.



**ILLUMINATING**

**GLASSWARE**



## "The Keystone" (Continued)

Code	Diameter Inches	Depth Inches	Fitter Diameter Inches	* Lamp Position Above Inches	Suggested Wattage	Standard Package	Approx. Wt. Lbs. Per Pkg.
816660	9 $\frac{1}{4}$	6 $\frac{9}{16}$	4	1 $\frac{1}{2}$	75	ctn 8 pc	20
816670	12 $\frac{1}{4}$	8 $\frac{3}{16}$	6	1 $\frac{1}{2}$	100	ctn 2 pc	9
816680	14 $\frac{1}{4}$	9 $\frac{3}{4}$	6	1 $\frac{1}{2}$	150	ctn 2 pc	12
816690	16 $\frac{1}{4}$	10 $\frac{5}{8}$	6	2	200	ctn 2 pc	16
816700	18 $\frac{1}{4}$	12 $\frac{7}{16}$	6	2	300	ctn 1 pc	12

\*Lamp Position — Represents the distance in inches of lamp contact above the plane of the fitter screws when using suggested wattage.

## "The Seville"

"THE SEVILLE" has long been a popular MONAX Brand lighting globe. It is economical, efficient and widely used for all types of general diffuse illumination.

Code	Diameter Inches	Depth Inches	Fitter Diameter Inches	Suggested Wattage	Std. Pkg.	Approx. Wt. Lbs. Per Pkg.
811190	8 $\frac{1}{2}$	5 $\frac{9}{16}$	4	60	12	25
813160	10	6 $\frac{1}{2}$	4	75	8	20
813170	12	7 $\frac{3}{4}$	6	100	4	18
813190	14	9	6	150	3	17
813200	16	10 $\frac{1}{4}$	6	200	2	17
813220	18	11 $\frac{3}{8}$	6	300	1	13
813230	20	12 $\frac{3}{4}$	8	500	1	17

Hangers and brackets shown with the Glassware in this Bulletin are for illustration purposes only. For complete information on hangers refer to Northern Electric Bulletin L-5-7.





# "The Pilgrim"



Simplicity of design coupled with the high efficiency of MONAX Brand glass characterize "THE PILGRIM" as an especially desirable globe for general diffuse illumination. An adequate range of sizes is offered in the following table. Orders should specify the quantity and each code required.

"THE PILGRIM" globe in 14" and 16" sizes may also be supplied without fitters for the so-called safety type holders where specifications or requirements involve fixtures of this type. Separate code numbers have been assigned to these two globes as indicated in the schedule below. No. 816830 represents No. 813000 with the fitter cut off and No. 816840 represents No. 813010 with the fitter cut off. Either of these are satisfactory for use with standard commercial holders available on the market.

Code	Diameter Inches	Depth Inches	Fitter Diameter Inches	* Lamp Position Above Inches	Suggested Wattage	Standard Package	Approx. Wt. Lbs. Per Pkg.
812980	10 <sup>7</sup> / <sub>16</sub>	8 <sup>5</sup> / <sub>16</sub>	4	<sup>1</sup> / <sub>2</sub>	75	ctn 4 pc	14
812990	12	9 <sup>3</sup> / <sub>16</sub>	6	<sup>1</sup> / <sub>2</sub>	100	ctn 2 pc	11
813000	14	10 <sup>1</sup> / <sub>2</sub>	6	1	150	ctn 2 pc	13
813010	16	11 <sup>3</sup> / <sub>4</sub>	6	1 <sup>1</sup> / <sub>2</sub>	200	ctn 2 pc	15
813020	18	13 <sup>3</sup> / <sub>16</sub>	6	1 <sup>1</sup> / <sub>2</sub>	300	ctn 1 pc	12

\*Lamp Position—Represents the distance in inches of lamp contact above the plane of the fitter screws when using suggested wattage.



# Staple Lightingware-Reflectors



Reflector No. 820120



Reflector No. 820090

## SPECIFICATIONS

### STAPLE LIGHTINGWARE

Number	Width in Inches	Depth in Inches	Fitter Diam.	No. Pcs. Stand. Carton	Approx. Lbs. Per Carton
<b>Ball Globes</b>					
823200	6	6	3 1/4	24	26
823220	8	8	4	12	24
800080	10	10	4	8	26
800060	10	10	5	8	26
800070	10	10	6	8	26
800020	12	12	6	2	12
800190	12	12	8	2	12
800090	14	14	6	1	10
800120	14	14	7	1	10
800140	14	14	8	1	10
800200	16	16	6	1	14
800040	16	16	8	1	14
800210	16	16	9	1	14
800030	18	18	8	1	19
800170	18	18	10	1	19
800150	20	20	8 1/4	1	28

### REFLECTORS

820090	6	4 13/16	2 1/4	12	12
820120	8	5 3/4	2 1/4	12	19
824160	10	5 3/8	2 7/8	12	28



Ball Globes Similar to No. 823200



Reflector No. 824160

# Northern Electric

COMPANY LIMITED

HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA  
 VAL D'OR TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
 PORT ARTHUR WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA





# Northern Electric Company

LIMITED

T.R. CAMPBELL  
ASST GENERAL SUPPLY SALES MANAGER  
OVERHEAD AND UNDERGROUND MANAGER  
D.C. ELMSLIE  
POWER APPARATUS MANAGER  
J.B. MUIR  
SUPPLY MANAGER  
D.C. BORDEN  
ILLUMINATION MANAGER  
F.E. RITCHIE  
RESALE MANAGER

## GENERAL SALES DIVISION

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TEL. WILBANK 4181

1620 NOTRE DAME STREET WEST

MONTREAL 3 QUE.

CABLE ADDRESS "NORELCO"

## SALES OFFICES:

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SHERBROOKE	VAL D'OR
TROIS RIVIERES	OTTAWA
TORONTO	LONDON
HAMILTON	KIRKLAND LAKE
WINDSOR	TIMMINS
SUDBURY	PORT ARTHUR
WINNIPEG	REGINA
CALGARY	EDMONTON
VANCOUVER	VERNON
	VICTORIA

NOR-LECTRIC BULLETIN L-6-3

## CORRECTION

In issuing Nor-Lectric Bulletin L-6-3, the lamp sizes were inadvertently omitted on pages 4 and 6 listing MDB and ADA floodlights.

The MDB 14 (14" floodlight) is designed for use with a 500 watt lamp and the MDB 16 (16" floodlight) for use with a 1000 watt lamp. In both cases, standard type P.S. lamp should be used.

Type ADA floodlight is designed for use with 250 watt type P.S. 30 lamp for standard service. Where a very narrow beam is required, the 250 watt G-30 floodlight service lamp may be used. When using this lamp, the floodlight must not be tipped more than 45 degrees below the horizontal.

Please insert this letter opposite page 4 of bulletin L-6-3 in your Nor-Lectric Bulletin Binder.

**S**TATISTICS show that poor street lighting is responsible for more than twenty percent of the accidents occurring at night. It must be evident to any one who has driven a car that adequate street and highway lighting would be a very large factor in reducing the number of such accidents.

If proper attention were given to the lighting of streets, parks and open areas, accidents would be reduced—crime kept down—congestion of traffic relieved—sanitary conditions improved—civic pride fostered and industries attracted.







ROR-ELECTRIC



BULLETIN

# STREET LIGHTING

MULTIPLE FIXTURES  
REFLECTORS  
BRACKETS  
CANOPIES



**S**TATISTICS show that poor street lighting is responsible for more than twenty percent of the accidents occurring at night. It must be evident to any one who has driven a car that adequate street and highway lighting would be a very large factor in reducing the number of such accidents.

If proper attention were given to the lighting of streets, parks and open areas, accidents would be reduced—crime kept down—congestion of traffic relieved—sanitary conditions improved—civic pride fostered and industries attracted.



## COMPLETE STREET LIGHTING UNITS

(Lamp not included)


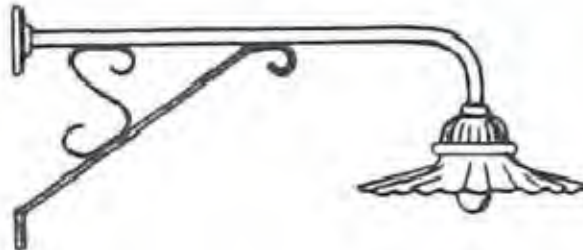
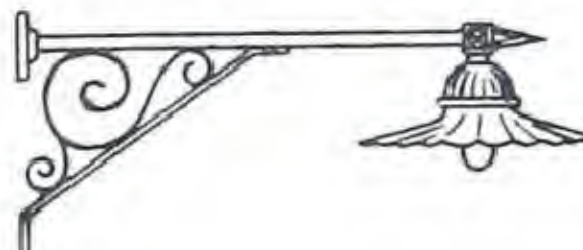
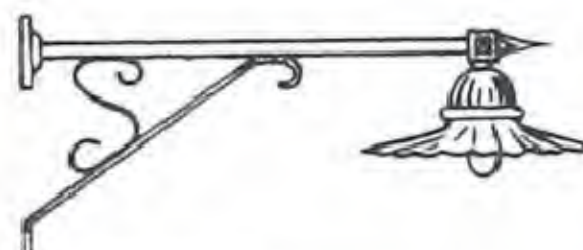
### MULTIPLE FIXTURES

Bracket Arm and Canopy are Hot Dip Galvanized.

Reflectors are Porcelain Enamelled Steel.

Medium Screw Socket

Canopy 6" Fitter.

	Exterior Wired		Interior Wired		Arm Proj.	Pipe	Ship Wt.
	Cat No.	Pole Plate	Cat. No.	Pole Plate			
	5101E	Plain	5101	1/2" cond.	4 ft.	3/4"	19#
	5102E	Plain	5102	Slotted	4 ft.	3/4"	19#
	5105E	Plain	5105	1/2" cond.	4 ft.	1"	24#
	5106E	Plain	5106	Slotted	4 ft.	1"	24#
	5117E	Plain	5117	1/2" cond.	4 ft.	3/4"	18#
	5118E	Plain	5118	Slotted	4 ft.	3/4"	18#
	5121E	Plain	5121	1/2" cond.	4 ft.	1"	21#
	5122E	Plain	5122	Slotted	4 ft.	1"	21#
	5169E	Plain	5169	1/2" cond.	4 ft.	1 1/4"	28#
	5170E	Plain	5170	Slotted	4 ft.	1 1/4"	28#
	5211E	Plain	5211	1/2" cond.	4 ft.	1 1/4"	27#
	5212E	Plain	5212	Slotted	4 ft.	1 1/4"	27#

### MISCELLANEOUS PARTS

Medium Socket #244-1

Ditto with adjustable support

Mogul Socket #2370, 2444, etc.

Ditto with adjustable support

Mogul Bi-post socket

Spearhead Cat. 1910

Hanger #2593 Ornamental







Socket Holder (Bakelite) # 2592



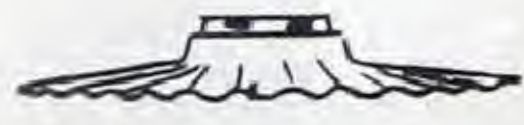
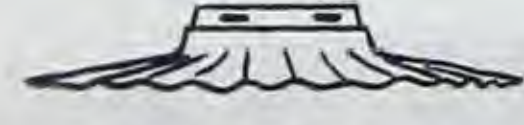
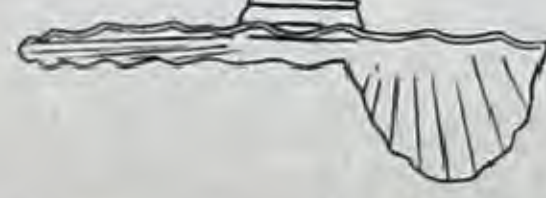
## CAST IRON MULTIPLE CANOPIES

Galvanized finish, 6" Fitter

State tapped hole required

	Cat. No.	Wiring	Socket	Fitter
	2050	Interior	Medium	6"
	2056	Interior	Mogul	6"
	2053	Interior	Medium	6"
	THES	Interior	Medium	6"
	2055			
	2070	Exterior	Medium	6"
	2046	Exterior	Mogul	6"
	2160	Interior	Medium	4"
	2161	Exterior	Medium	4"


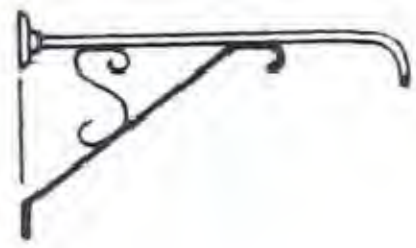

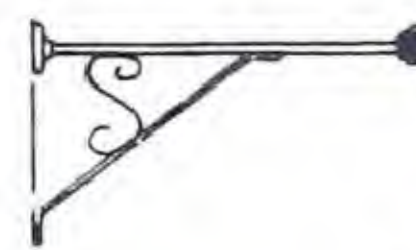





## REFLECTORS

	Cat. No.	Part	Diameter	Fitter
	314	Reflector	18"	6" with slots
	314A	Reflector	18"	6" no slots
	316A	Reflector	18"	4" no slots
	317	Reflector	20"	4" with slots
	317A	Reflector	20"	4" no slots
	317AS-2	Reflector	20"	4" no slots



## WROUGHT IRON BRACKETS

GALVANIZED

	Cat. No.	Dimensions	Weight	Wire Entrance
	1001	$\frac{3}{4}" \times 4'$	11 lbs.	Conduit
	1002	$\frac{3}{4}" \times 4'$	11 "	Slotted
	x 1005	$1" \times 4'$	14 "	Conduit
	x 1006	$1" \times 4'$	14 "	Slotted
	1140	$1\frac{1}{4}" \times 4'$	19 "	Conduit
	1141	$1\frac{1}{4}" \times 4'$	19 "	Slotted
	1017	$\frac{3}{4}" \times 4'$	10 lbs.	Conduit
	1018	$\frac{3}{4}" \times 4'$	10 "	Slotted
	x 1021	$1" \times 4'$	12 "	Conduit
	x 1022	$1" \times 4'$	12 "	Slotted
	1142	$1\frac{1}{4}" \times 4'$	18 "	Conduit
	1143	$1\frac{1}{4}" \times 4'$	18 "	Slotted
	1053	$1\frac{1}{4}" \times 3'$	17 lbs.	Conduit
	1054	$1\frac{1}{4}" \times 3'$	17 "	Slotted
	x 1069	$1\frac{1}{4}" \times 4'$	18 "	Conduit
	x 1070	$1\frac{1}{4}" \times 4'$	18 "	Slotted
	1126	$1\frac{1}{4}" \times 3'$	16 lbs.	Conduit
	1127	$1\frac{1}{4}" \times 3'$	16 "	Slotted
	x 1111	$1\frac{1}{4}" \times 4'$	18 "	Conduit
	x 1112	$1\frac{1}{4}" \times 4'$	18 "	Slotted
	1164	$1\frac{1}{4}" \times 4'$	20 lbs.	Conduit
	1165	$1\frac{1}{4}" \times 4'$	20 "	Slotted
	1172	$1\frac{1}{4}" \times 4'$	18 lbs.	Conduit
	1173	$1\frac{1}{4}" \times 4'$	18 "	Slotted
	1158	$1" \times 4'$	15 lbs.	Conduit
	1159	$1" \times 4'$	15 "	Slotted
	1160	$1\frac{1}{4}" \times 4'$	17 "	Conduit
	1161	$1\frac{1}{4}" \times 4'$	17 "	Slotted
	1156	$\frac{3}{4}" \times 4'$	8 lbs.	Conduit
	1166	$1" \times 4'$	10 "	Conduit
	x 1118	$1\frac{1}{4}" \times 20"$	10 lbs.	Conduit
	1119	$1\frac{1}{4}" \times 20"$	10 "	Slotted

x Stock Patterns — order for prompt shipment.

# Northern Electric

COMPANY LIMITED

HALIFAX SAINT JOHN, N.B. QUEBEC TROIS RIVIERES SHERBROOKE MONTREAL OTTAWA VAL D'OR  
 TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY PORT ARTHUR  
 WINNIPEG REGINA CALGARY EDMONTON VERNON VANCOUVER VICTORIA





November 1947

L-8-2

NOR-ELECTRIC



BULLETIN



No. 76633 - 3 Lights  
Length.....30 inches  
Spread.....12½ inches  
FINISH: French Gold  
with Beige  
highlighted Glass



No. 76643 - 3 Lights  
Depth.....6½ inches  
Spread.....12½ inches  
FINISH: French Gold  
with Beige  
highlighted Glass

RESIDENTIAL LIGHTING



Finish  
**FRENCH GOLD**

with  
Amber Toned Glass

★ ★ ★

No. 14354 - 4 Lights  
Length.....9¼ inches  
Spread.....16 inches

★ ★ ★

No. 79034 - 4 Lights  
Length.....30 inches  
Spread.....16 inches

★ ★ ★

No. 79054 - 4 Lights  
Length.....15 inches  
Spread.....16 inches



No. 14354



No. 79054



No. 79034





No. 12781



No. 15931



No. 15851



No. 12731

**Finish**  
**FRENCH GOLD**

with Beige Glass

★ ★ ★

No. 12731 - 1 Light  
Length.....30 inches  
Spread.....10½ inches

★ ★ ★

No. 12781 - 1 Light  
Back Plate.....7x4 inches  
Extends.....7½ inches

★ ★ ★

No. 15851 - 1 Light  
Length.....9 inches  
Spread.....12 inches

★ ★ ★

No. 15931 - 1 Light  
Length.....30 inches  
Spread.....12 inches



Finish  
**BRONZOID**

with Amber  
Colour Glass Shades

★ ★ ★

No. 14231 - 1 Light  
Length.....30 inches  
Spread.....10½ inches

★ ★ ★

No. 14233 - 3 Lights  
Length.....30 inches  
Spread.....15 inches

★ ★ ★

No. 14235 - 5 Lights  
Length.....30 inches  
Spread.....18 inches

★ ★ ★

No. 14281 - 1 Light  
Back Plate.....6½x10  
                          inches  
Extends.....5 inches



No. 14233



No. 14281



No. 14231



No. 14235



**Finish  
IVORY AND GOLD**

with Ivory  
Toned Glass Shades

★ ★ ★

No. 12333 - 3 Lights  
Length.....30 inches  
Spread.....17 inches

★ ★ ★

No. 12335 - 5 Lights  
Length.....30 inches  
Spread.....19 inches

★ ★ ★

No. 12351 - 1 Light  
Length.....9 $\frac{1}{4}$  inches  
Spread.....8 inches

★ ★ ★

No. 12381 - 1 Light  
Back Plate.....5 inches  
Extends.....6 $\frac{1}{2}$  inches



No. 12333



No. 12351



No. 12381



No. 12335



**FINISH:** Ivory and Gold  
**GLASS SHADE:** Rose, Beige or Ivory  
**No. 11531** - 1 Light  
 Depth.....11 inches  
 Spread.....6 inches

★ ★ ★

**FINISH:** French Gold  
 White Pebbled  
 Decorated  
 Ceramic Glass  
**No. 12131** - 1 Light  
 Length.....30 inches  
 Spread.....7 inches

★ ★ ★

**FINISH:** French Gold  
 White Pebbled  
 Decorated  
 Ceramic Glass  
**No. 12181** - 1 Light  
 Back Plate.7x4 $\frac{1}{4}$  inches  
 Extends.....3 $\frac{1}{2}$  inches

★ ★ ★

**FINISH:** Old Gold  
**No. 41111** - 1 Light  
 Length.....30 inches  
 Spread.....7 $\frac{1}{2}$  inches

★ ★ ★

**FINISH:** Old Gold  
 Amber or Crystal  
 Glass  
**No. 78131** - 1 Light  
 Length.....30 inches  
 Spread.....6 inches  
 Cylinder.....6x4 inches



No. 11531



No. 41111



No. 12181



No. 12131



No. 78131





No. 15451



No. 72181



No. 72881



No. 13581



No. 13151—6" dia.  
No. 13152—8" dia.  
No. 13252—10" dia.



No. 12851



No. 16981

**FINISH:** White Enamel

**SHADE:** Opal and Crystal

No. 12851 - 1 Light - Keyless  
Depth.....8 inches  
Spread.....9 inches  
Fitter.....4 inches

★ ★ ★

**FINISH:** Chrome  
**BOWL:** Opal and Crystal

No. Lights Bowl  
13151—1...6x4½ inches  
13152—2.....8x5 inches  
13252—2...10x5½ inches

★ ★ ★

**FINISH:** White Enamel

**SHADE:** Opal and Crystal

No. 13581 - 1 Light - Keyless  
Extends.....7½ inches  
Fitter.....3¼ inches

★ ★ ★

**FINISH:** White Enamel

**SHADE:** Opal and Crystal

No. 15451 - 1 Light - Keyless  
Depth.....9 inches  
Spread.....9 inches  
Fitter.....4 inches

★ ★ ★

**FINISH:** Chrome  
**SHADE:** Opal with Clear Lines

No. 16981 - 1 Light - Keyless  
Extends.....6 inches

★ ★ ★

**FINISH:** White Enamel

**SHADE:** Opal

No. 72181 - 1 Light - Keyless  
Extends.....7½ inches  
Fitter.....2¼ inches

★ ★ ★

**FINISH:** Chrome  
**SHADE:** Opal

No. 72881 - 1 Light - Keyless  
Extends.....6½ inches  
Width.....8 inches



FINISH: Ivory or  
Bronze  
No. 600 - Two light pan  
Depth..... 12 inches  
Spread..... 11½ inches

★ ★ ★

FINISH: Ivory or  
Bronze  
No. 3303 - Beamlight  
Wired with socket,  
straps, screws, and nuts.  
Depth..... 5¼ inches  
Spread..... 5¼ inches

★ ★ ★

FINISH: Old Ivory  
or Bronzoid  
No. 62841 - 1 Light  
Depth..... 2½ inches  
Spread..... 6 inches

★ ★ ★

FINISH: Ivory and  
Gold  
No. 78242 - 2 Lights  
Depth..... 2½ inches  
Spread..... 12½ inches

★ ★ ★

FINISH: Ivory and  
Gold  
No. 79441 - 1 Light  
Depth..... 3¼ inches  
Spread..... 5¼ inches



No. 600



No. 79441



No. 62841



No. 3303



No. 78242





No. 79752

FINISH: Ivory and  
Gold with Ivory,  
Rose, or Tan Glass  
No. 799 - 1 Light Fixture  
Depth.....12 inches  
Spread.....11½ inches

★ ★ ★

FINISH: Ivory  
GLASS SHADE: Rose,  
Beige or Ivory  
No. 12451 - 1 Light  
Length.....9 inches  
Spread.....10½ inches

★ ★ ★



No. 799

FINISH: Ivory  
GLASS SHADE: Rose,  
Beige or Ivory  
No. 78651 - 1 Light  
Length.....9 inches  
Spread.....11 inches

★ ★ ★

FINISH: Old Gold  
GLASS SHADE: Rose  
or Ivory  
No. 79752 - 2 Lights  
Depth.....5½ inches  
Spread.....9 inches



No. 78651



No. 12451



**FINISH: Swedish Steel**  
**Crystal Clear Glass**  
**No. 455**

Back Plate..... $4\frac{3}{4}$  inches  
 Height..... $7\frac{1}{4}$  inches  
 Height Overall 10 inches

★ ★ ★

**FINISH: Swedish Steel**  
**Crystal Clear Glass**  
**No. 456**

Back Plate..... $4\frac{3}{4}$  inches  
 Height..... $7\frac{1}{4}$  inches  
 Height Overall 10 inches

★ ★ ★

**FINISH: Cracked Black**  
**Frosted Glass Panels**  
**No. 10931 - 1 Light**  
 Length.....30 inches  
 Spread..... $5\frac{1}{2}$  inches

★ ★ ★

**FINISH: Natural Copper**  
**Amber or Crystal Glass**  
**No. 71541**

Depth.....7 inches  
 Spread.....6 inches  
 Fitter..... $3\frac{1}{4}$  inches

★ ★ ★

**FINISH: Natural Copper**  
**Amber or Crystal Glass**  
**No. 71581**

Length.....9 inches  
 Extends.....7 inches



No. 10931



No. 456



No. 71581



No. 455



No. 71541





No. 2900



No. 2901



No. 2900

FINISH: Crystal with  
Chrome Trim  
No. 2900 - Boudoir Lamp  
Height.....13 inches

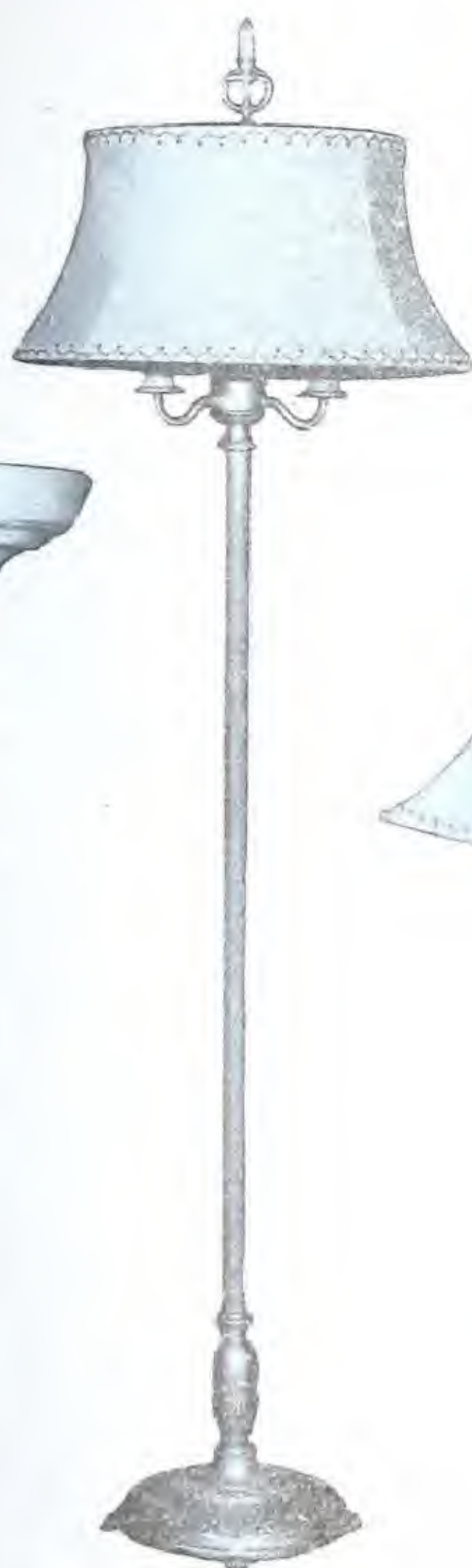
★ ★ ★

FINISH: Crystal with  
Chrome Trim  
No. 2901 - Bed Lamp  
Length.....13 inches

★ ★ ★



No. 5025



No. 4023



No. 4123



No. 4024

FINISH: Bronze and  
Gold  
SHADE: Eggshell,  
Beige or Rust  
No. 4023 - Trilite

★ ★ ★

FINISH: Bronze and  
Gold  
SHADE: Eggshell  
Beige or Rust  
No. 4024 - Trilite

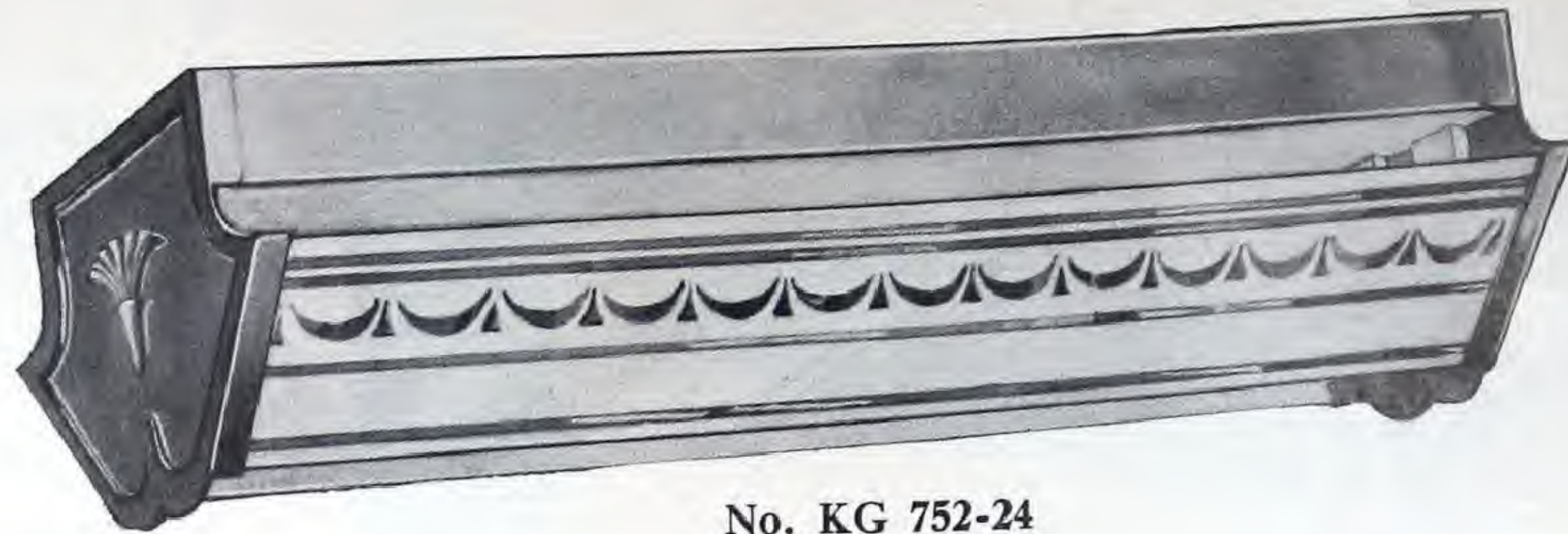
★ ★ ★

FINISH: Bronze and  
Gold  
SHADE: Eggshell  
Beige or Rust  
No. 4123 Bridge Lamp

★ ★ ★

FINISH: Bronze and  
Gold  
No. 5025 - Torchier

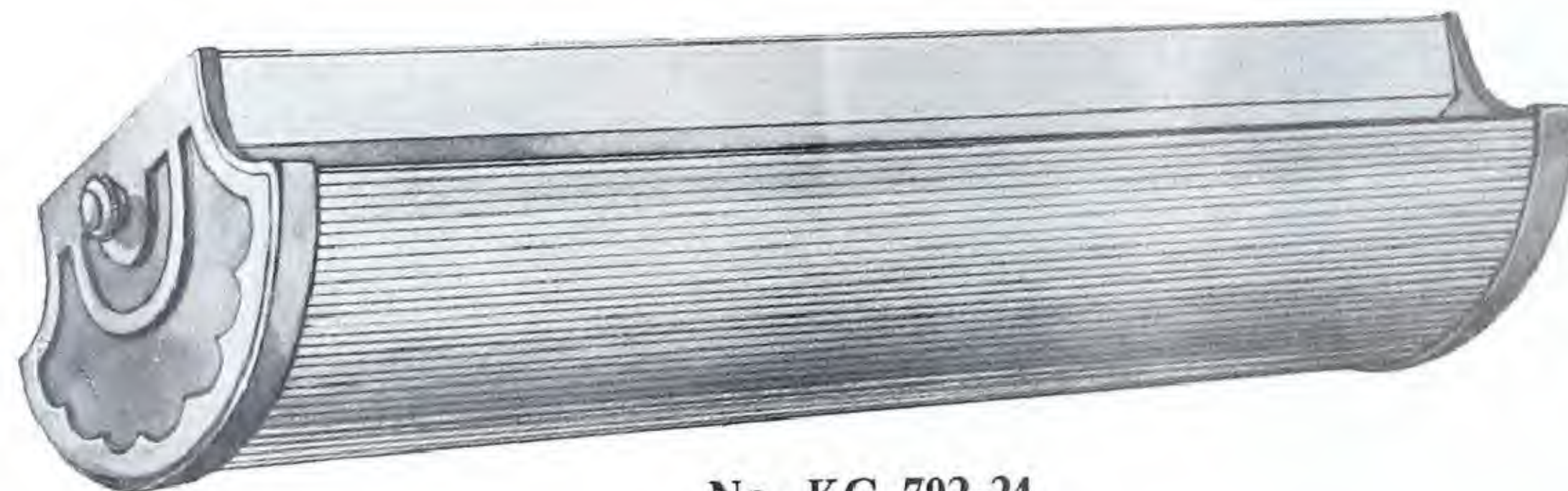




No. KG 752-24

FINISH: Baked White Enamel  
All Reflecting Surfaces  
BAKED HARD WHITE ENAMEL

Number	Lights	Watts per Light	BODY DIMENSIONS		
			Width	Height	Length
KG 752-24	2	20	7"	5 $\frac{3}{4}$ "	24 $\frac{1}{2}$ "
KG 753-24	3	20	7"	5 $\frac{3}{4}$ "	24 $\frac{1}{2}$ "



No. KG 792-24

FINISH: Satin Pewter  
All Reflecting Surfaces  
BAKED HARD WHITE ENAMEL  
Equipped with curved ribbed glass

Number	Lights	Watts per Light	BODY DIMENSIONS		
			Width	Height	Length
KG 792-24	2	20	8 $\frac{7}{8}$ "	5 $\frac{3}{4}$ "	24 $\frac{1}{2}$ "
KG 793-24	3	20	8 $\frac{7}{8}$ "	5 $\frac{3}{4}$ "	24 $\frac{1}{2}$ "

L-8-2  
10M-11-47

**Northern Electric**  
COMPANY LIMITED



HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
PORT ARTHUR WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA

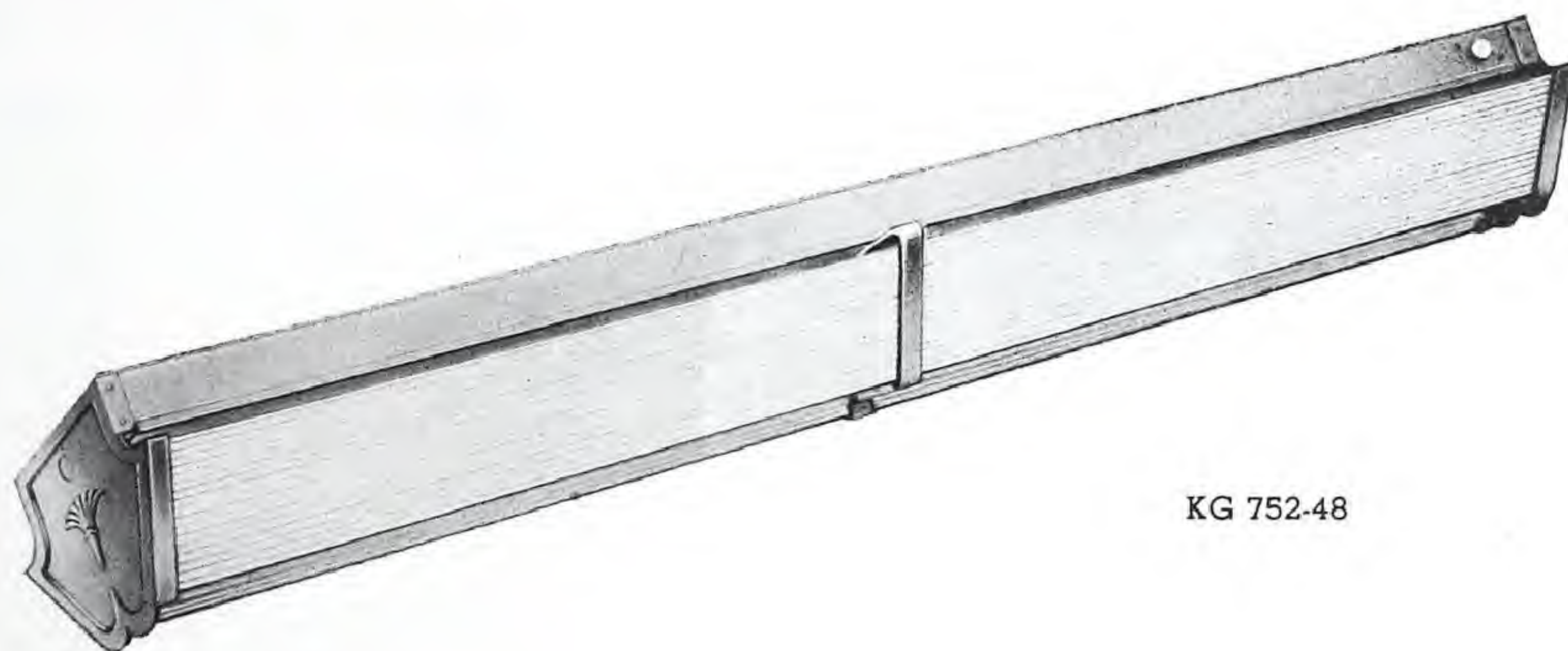
PRINTED  
IN  
CANADA



# NOR-ELECTRIC BULLETIN

**N**  
**E** A NATIONAL ELECTRICAL SERVICE  
Northern Electric  
COMPANY LIMITED

## *Twin-Forty* **FLUORESCENT KITCHEN UNIT**



KG 752-48

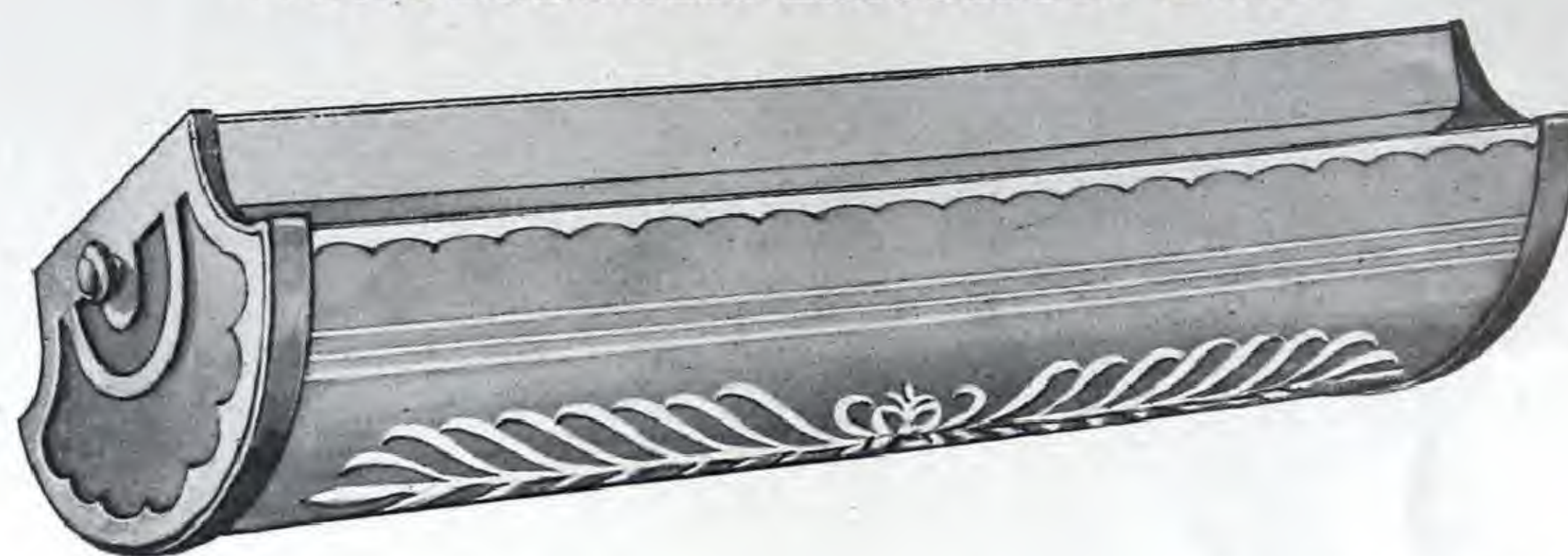
This new kitchen luminaire uses two 40 watt fluorescent lamps, shielded by Alba-Lite glass panels. Fixture comes complete with FS4 starters and four 2-foot Alba-Lite panels. Finish is baked white enamel. All reflecting surfaces baked hard white enamel.

### DIMENSIONS

Cat. No.	Lights	Watts per light	Body Dimensions		
			Width	Height	Length
KG 752-48	2	40	7"	5 $\frac{3}{4}$ "	48 $\frac{1}{2}$ "
As above except using 20 watt lamps, FS2 starters and two 2-foot Alba-Lite panels.					
KG 752-24	2	20	7"	5 $\frac{3}{4}$ "	24 $\frac{1}{2}$ "
KG 753-24	3	20	7"	5 $\frac{3}{4}$ "	24 $\frac{1}{2}$ "



## Fluorescent Kitchen Unit



KG 802-24; KG 803-24

Proper illumination can contribute much to atmosphere in the home. These fluorescent fixtures, available in French Gold finish, will light-condition your room. The new decorated ceramic glass in either white or rose colour provides glowing warmth along with high illumination. Its beauty will enhance the decorative effect of the entire interior.

Finish: French Gold.

All reflecting surfaces are baked hard white enamel. Equipped with curved decorated ceramic glass—white or rose colour.

### DIMENSIONS

Cat. No.	Lights	Watts per light	Body Dimensions		
			Width	Height	Length
KG 802-24	2	20	8 $\frac{7}{8}$ "	5 $\frac{3}{4}$ "	24 $\frac{1}{2}$ "
KG 803-24	3	20	8 $\frac{7}{8}$ "	5 $\frac{3}{4}$ "	24 $\frac{1}{2}$ "

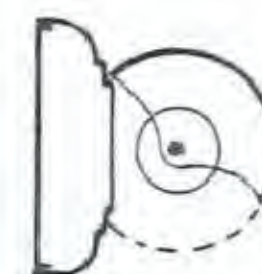
## Fluorescent Brackets



K 41-18



K51-18



KG 261-18

Bracket No. K51-18 can be used horizontally or vertically. The adjustable shields make it possible to control the light in any direction. Bracket No. KG261-18 is identical to K 41-18 with the addition of a decorated white ceramic glass shield producing a very decorative effect. Finish: Baked white enamel or Bright chrome. Please specify finish desired.

### DIMENSIONS

Cat. No.	Lights	Watts per light	Body Dimensions		
			Width	Height	Length
K 41-18	1	15	4 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "	20"
K 51-18	1	15	4 $\frac{1}{2}$ "	4 $\frac{1}{2}$ "	20"
KG 261-18	1	15	4 $\frac{1}{2}$ "	4"	20"

**Northern Electric**  
COMPANY LIMITED

HAUFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
PORT ARTHUR WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA





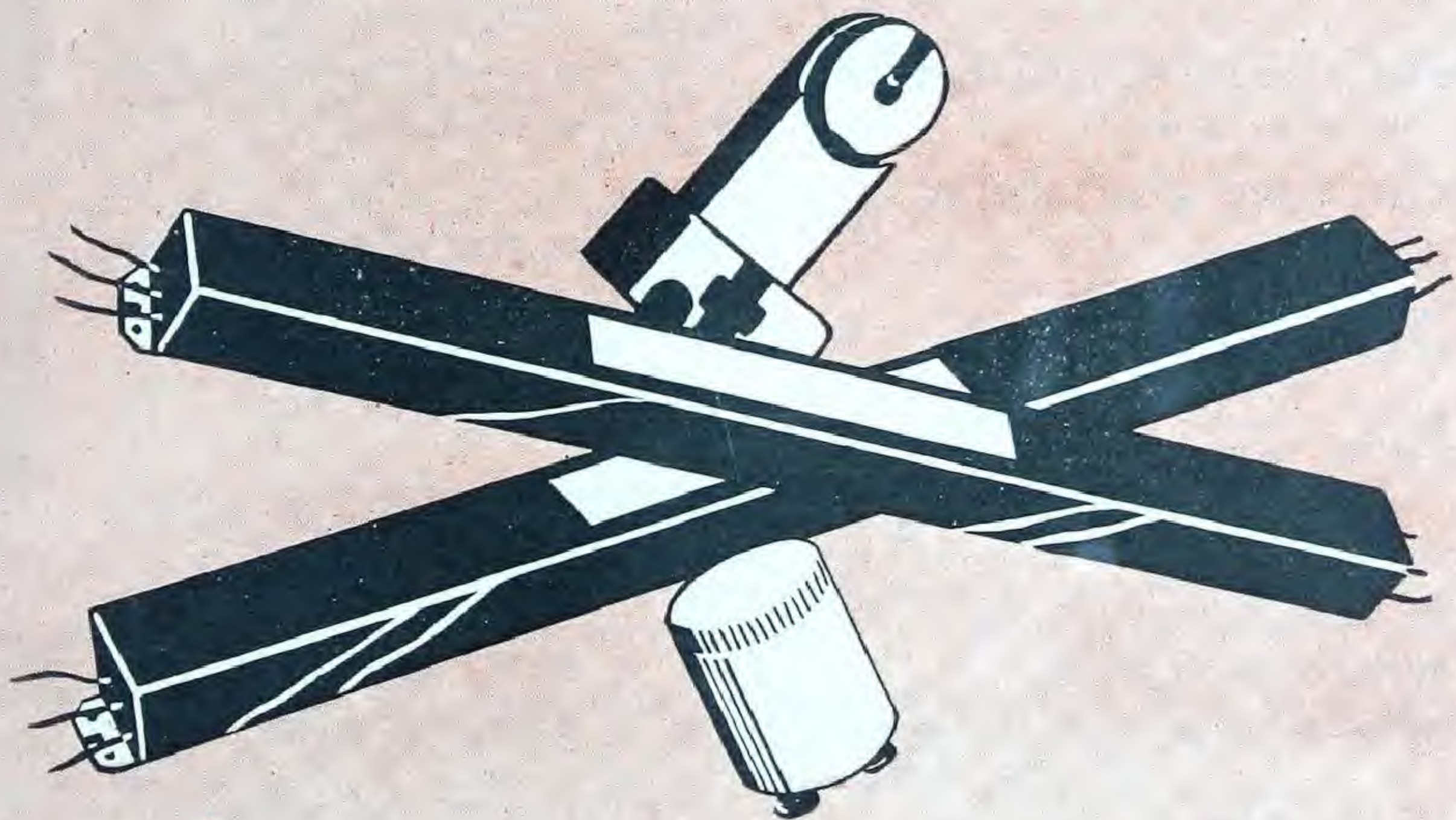
November, 1945 L-11-1

OR-ELECTRIC



BULLETIN

# ACCESSORIES



*for*

## FLUORESCENT FIXTURES



**FOR STANDARD SIZE LAMPS**

(T-8 AND T-12 15, 20, 30 AND 40 WATTS)

**LAMPHOLDERS**

FOR 1-INCH AND 1½-INCH LAMPS

**TWIST TURN CONTACTING**

FLUSH OR SURFACE MOUNTING



No. 4300

Cat. No.	Description	Carton	Std. Pkg.	Pkg. Wt.
4300	Black	10	100	6
4300-W	White	10	100	6



No. 4307

**TWIST TURN CONTACTING  
WITH STARTER SOCKETS**

Cat. No.	Description	Carton	Std. Pkg.	Pkg. Wt.
4307	Black	10	100	10
*4307-W	White	10	100	10

\*Lampholder only is white; Starter Socket is black.

**FIXTURE LAMPHOLDERS**

FOR 1-INCH LAMPS ONLY

**STRAIGHT PUSH CONTACTING**

No. 4303

Cat. No.	Description	Carton	Std. Pkg.	Pkg. Wt.
WITH METAL BRACKET				
4303	Black	10	100	6
4303-W	White	10	100	6
WITHOUT METAL BRACKET				
4304	Black	10	100	6
4304-W	White	10	100	6

**TWIST TURN CONTACTING  
WITH WIRE LEADS**

ONE 9-INCH AND ONE 27-INCH LEAD OF No. 18 CF WIRE



No. 4328

**SURFACE MOUNTING  
FOR 1-INCH AND 1½-INCH LAMPS**

Cat. No.	Description	Carton	Std. Pkg.	Pkg. Wt.
4328	Black	10	100	5
4328-W	White	10	100	5

**STARTER SOCKETS**

SEPARATE OR REMOTE MOUNTING

Cat. No.	Description	Carton	Std. Pkg.	Pkg. Wt.
4309	Black	10	100	5



No. 4309

**LAMP STARTERS**

FOR 15 AND 20-WATT LAMPS

Cat. No.	Carton	Std. Pkg.	Pkg. Wt.
FS2	10	100	2



FOR 30 AND 40-WATT LAMPS

Cat. No.	Carton	Std. Pkg.	Pkg. Wt.
FS4	10	100	2

Nos. FS2 and FS4

**"NO-BLINK" STARTER**

FOR 40-WATT LAMPS ONLY

Cat. No.	Carton	Std. Pkg.	Pkg. Wt.
FS4-NA	10	100	3

This starter prevents annoying blinking and flickering of lamps when they have reached the end of their normal life.



No. FS4-NA

**STARTER FOR LOW TEMPERA-  
TURE OR D.C. OPERATION**

FOR 40-WATT LAMPS ONLY

Cat. No.	Carton	Std. Pkg.	Pkg. Wt.
FS44	10	50	3

Improves starting performance in outdoor applications. (Mogul size starter No. 4369 must be used with FS44.)

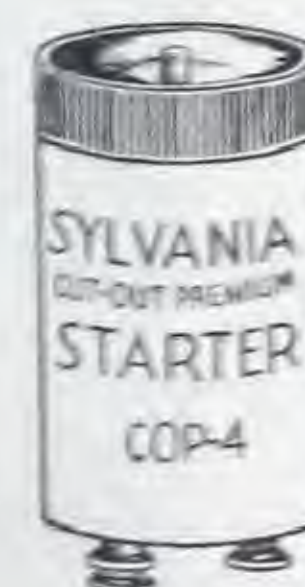


No. FS44

**"COP" STARTER**

FOR 40-WATT LAMPS

Manual re-set starter that immediately cuts out deactivated lamp. Eliminates annoying flashing and danger to ballast. A push of the re-set button when new lamp is inserted puts starter in operation.



No. FS5

**FOR MIDGET SIZE LAMPS**

(T-5 4, 6 AND 8 WATTS)



No. 4330

Cat. No.	Description	Carton	Std. Pkg.	Pkg. Wt.
4330	Black	10	100	2
4330-W	White	10	100	2

Mounting hole centers 4 watt lamp, 5½" — 6 watt lamp, 8½" — 8 watt lamp, 11½".

Cat. No.	Carton	Std. Pkg.	Pkg. Wt.
FS5	10	50	2

Starter sockets for No. FS5 starters are built into the ballast unit for these small lamps. Should a separate Starter Socket be desired No. 4309 may be used.



## FOR MOGUL SIZE LAMPS

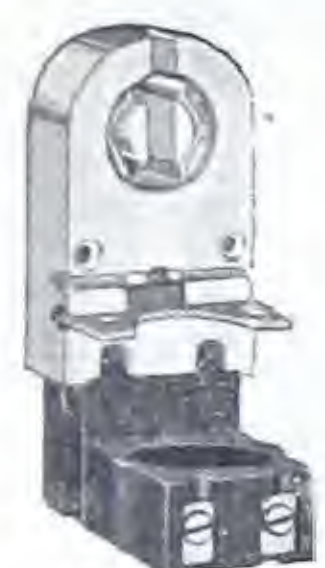
(T-17 65 AND 100 WATTS)

### LAMPHOLDERS



No. 4350-W

Cat. No.	Description	Carton	Std. Pkg.	Pkg. Wt.
WITH METAL BRACKET				
4350-W	White	10	50	6
WITHOUT METAL BRACKET				
4351-W	White	10	50	6



No. 4367-W

WITH STARTER SOCKETS				
TAKES 2-PIN AND 4-PIN STARTERS				
Cat. No.	Description	Carton	Std. Pkg.	Pkg. Wt.
WITH METAL BRACKET				
4367-W	White	10	50	10
WITHOUT METAL BRACKET				
4368-W	White	10	50	10

### STARTER SOCKETS

FOR SEPARATE OR REMOTE MOUNTING

TAKES 2-PIN AND 4-PIN STARTERS

Cat. No.	Description	Carton	Std. Pkg.	Pkg. Wt.
4369	Black	10	50	4



No. 4369

### LAMP STARTERS

Cat. No.	Carton	Std. Pkg.	Pkg. Wt.
FOR 65-WATT LAMPS			
FS64	10	50	3
FOR 100-WATT LAMPS			
FS6	10	50	3
"NO-BLINK" STARTER			
FOR 100-WATT LAMPS			
FS6-NA	10	50	4



No. FS6

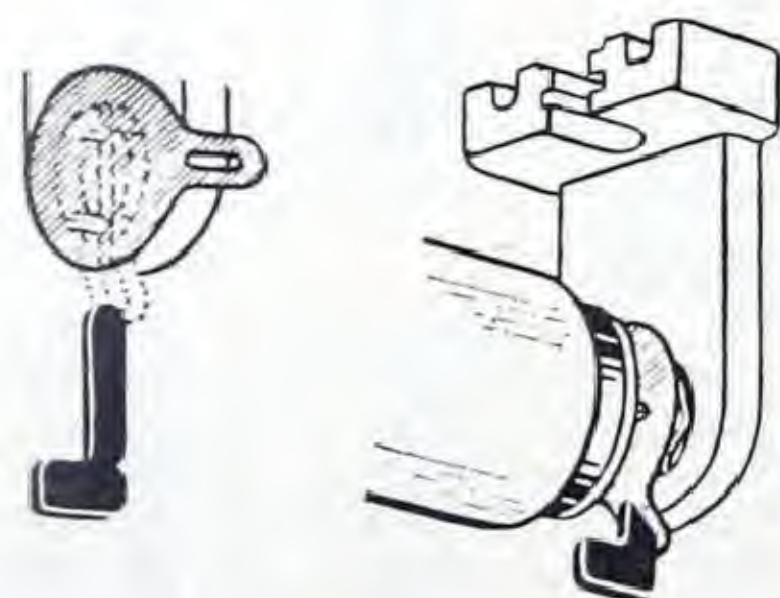
## LAMP LOCKS

#### Catalog No. FL-20-40 and FL-65-100

Designed for use with 20 to 100W. lamps in twist lock holders. Locks this popular type of lamp securely to fixture and reduces other difficulties arising from vibration.

##### TO INSTALL

Place discs over bipins at each end of lamp, install lamp, bend slot to correspond with slot in picture, insert key through slot into socket, engage notch of key into edge of slot in disc, lock.

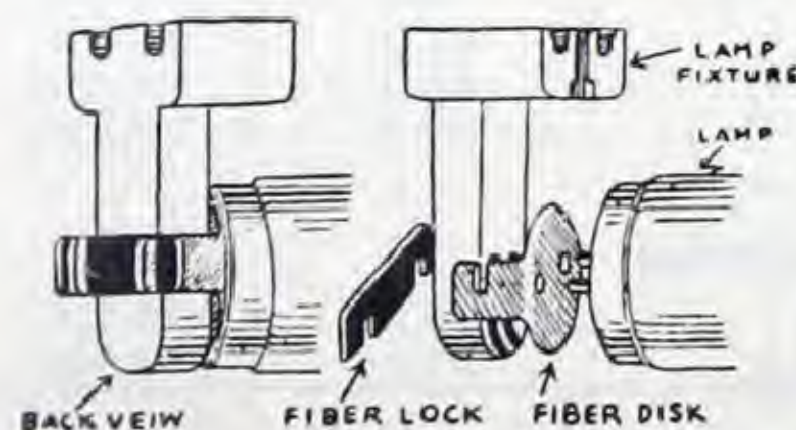


#### Catalog No. FL-20-40J

For 20 to 40W. fluorescent lamps used in type J double slotted socket—push pin type.

##### TO INSTALL

Fit disc over bipins at each end of lamp, bend tabs of lock so that they protrude in back of lamp holder, fit notches in key in notches of lock.

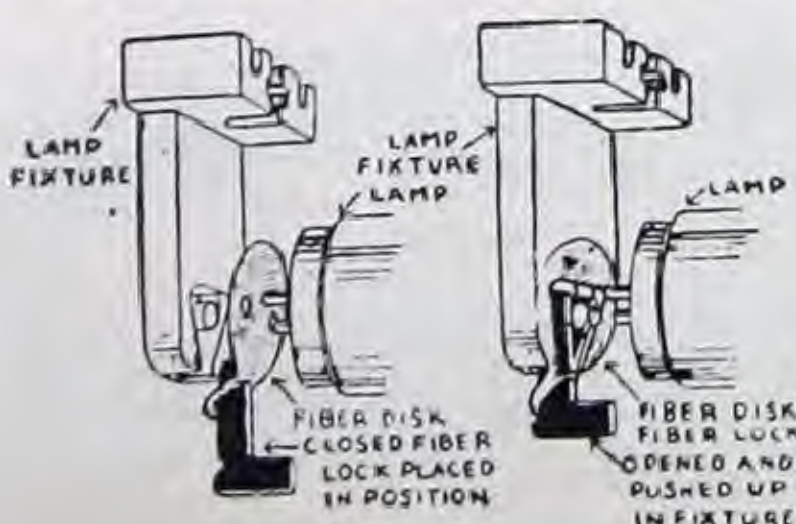


#### Catalog No. FL-20-40K and FL-65-100K

For use with 20 to 100W. fluorescent lamps in Sylvania and other similar type sockets.

##### TO INSTALL

Place one lock on bipins at each end of lamp, install lamp, insert split key through slot in tab of lock and into socket. Key will separate and half will pass either side of centre obstruction in socket. See that notch in key is engaged in edge of slot in tab.





# BALLASTS



## JEFFERSON BALLAST DATA AND DIMENSIONS

### TWO LAMP BALLASTS—60 CYCLES—HIGH POWER FACTOR—WITH BUILT-IN COMPENSATOR

Cat. No.	Lamp Watts	Circuit Voltage	Size Overall, Inches			Approx. Weight Lbs.	Approx. Watts Loss	Approx. Power Factor %
			High	Wide	Long			
234-701	2-15	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	14 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>	8 to 9	95-100
234-711	2-20	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	14 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>	10.0	95-100
234-841	2-30	110-125	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	9 <sup>7</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>4</sub>	14.5	95-100
234-843	2-30	220-250	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	9 <sup>7</sup> / <sub>16</sub>	6 <sup>1</sup> / <sub>2</sub>	12.5	95-100
234-846	2-30	199-216	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	9 <sup>7</sup> / <sub>16</sub>	6 <sup>1</sup> / <sub>2</sub>	12.0	95-100
234-881	2-40	110-125	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	9 <sup>7</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>4</sub>	14.0	95-100
234-883	2-40	220-250	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	9 <sup>7</sup> / <sub>16</sub>	6 <sup>1</sup> / <sub>2</sub>	13.0	95-100
234-886	2-40	199-216	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	9 <sup>7</sup> / <sub>16</sub>	6 <sup>1</sup> / <sub>2</sub>	12.0	95-100
*234-791	2-100	110-125	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	19 <sup>3</sup> / <sub>16</sub>	15 <sup>1</sup> / <sub>2</sub>	35.0	95-100
*234-793	2-100	220-250	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	19 <sup>3</sup> / <sub>16</sub>	15 <sup>1</sup> / <sub>2</sub>	35.0	95-100
*234-796	2-100	199-216	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	19 <sup>3</sup> / <sub>16</sub>	15 <sup>1</sup> / <sub>2</sub>	35.0	95-100

\*No compensator necessary for 100-watt ballasts.

### TWO LAMP BALLAST—25 CYCLES—HIGH POWER FACTOR—WITH BUILT-IN COMPENSATOR

234-882	2-40	110-125	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	19 <sup>3</sup> / <sub>16</sub>	18	15	90-100
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### SINGLE LAMP BALLASTS—60 CYCLES—NORMAL POWER FACTOR

234-501	15	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>4</sub>	3 <sup>4</sup> / <sub>4</sub>	3.5 to 4.5	55
234-511	20	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	4 <sup>1</sup> / <sub>4</sub>	3 <sup>4</sup> / <sub>4</sub>	4.5	65
234-541	30	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	10 <sup>1</sup> / <sub>2</sub>	2 <sup>3</sup> / <sub>4</sub>	7.0	60
234-543	30	220-250	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	8	2 <sup>1</sup> / <sub>4</sub>	6.75	50
234-546	30	199-216	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	8	2 <sup>1</sup> / <sub>4</sub>	6.25	55
234-581	40	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	10 <sup>1</sup> / <sub>2</sub>	2 <sup>3</sup> / <sub>4</sub>	8.75	65
234-583	40	220-250	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	8	2 <sup>1</sup> / <sub>4</sub>	10.0	55
234-586	40	199-216	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	8	2 <sup>1</sup> / <sub>4</sub>	9.0	60

### SINGLE LAMP BALLASTS—60 CYCLES—HIGH POWER FACTOR

234-601	15	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	9	1 <sup>1</sup> / <sub>2</sub>	3.5 to 4.5	90-100
234-611	20	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	9	1 <sup>1</sup> / <sub>2</sub>	4.5	90-100
234-641	30	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	14 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>	7.0	90-100
234-643	30	220-250	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	10 <sup>15</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	6.75	90-100
234-646	30	199-216	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	10 <sup>15</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	6.25	90-100
234-681	40	110-125	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	15 <sup>1</sup> / <sub>2</sub>	3 <sup>1</sup> / <sub>2</sub>	8.75	90-100
234-683	40	220-250	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	10 <sup>15</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	10.0	90-100
234-686	40	199-216	1 <sup>5</sup> / <sub>16</sub>	1 <sup>27</sup> / <sub>32</sub>	10 <sup>15</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>2</sub>	9.0	90-100
234-691	100	110-125	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	14 <sup>5</sup> / <sub>16</sub>	11	23.0	90-100
234-693	100	220-250	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	14 <sup>5</sup> / <sub>16</sub>	11	23.0	90-100
234-696	100	199-216	2 <sup>3</sup> / <sub>8</sub>	3 <sup>3</sup> / <sub>32</sub>	14 <sup>5</sup> / <sub>16</sub>	10 <sup>1</sup> / <sub>2</sub>	23.0	90-100

### THREE LAMP BALLAST—60 CYCLES—HIGH POWER FACTOR

234-980	3-40	220-250	2 <sup>3</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>32</sub>	14 <sup>5</sup> / <sub>16</sub>	11	19.0	90-100
234-983	3-40	110-125	2 <sup>3</sup> / <sub>8</sub>	3 <sup>5</sup> / <sub>32</sub>	14 <sup>5</sup> / <sub>16</sub>	11	20.0	95-100

# Northern Electric

COMPANY LIMITED

HALIFAX SAINT JOHN, N.B. QUEBEC TROIS RIVIERES SHERBROOKE MONTREAL OTTAWA VAL D'OR  
TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY PORT ARTHUR  
WINNIPEG REGINA CALGARY EDMONTON VERNON VANCOUVER VICTORIA





**NOR-ELECTRIC**



**BULLETIN**

**MARINE.  
PORTABLE.**

# MASTER-LIGHTS

**UTILITY.  
SEARCHLIGHTS.**

**MARINE**

**- PORTABLE**

**- UTILITY**



Type 106

6" diameter housed reflector searchlight for small craft. Patented Pilot-House Instant Lever Master control. Searchlight range: half mile.

This light is economical and one of the most popular marine lights. The Lever Master Control is a great improvement over any "push-and-pull" control type. Furnished in either full chromium or polished brass and bronze.

Height above deck: 11½ inches. A No. 4524 6-volt sealed beam bulb is used with this light.



Type 1028

8" diameter housed reflector searchlight for large craft. Searchlight range: one mile. Outside control from the deck with switch either on light or on instrument board. Height above deck: 14½ inches. A No. C76 6-volt bayonet base super bulb is used with this light.

Super-bulbs with black caps are made according to exacting specifications insuring longer battery burning hours, the greatest brilliancy and power of the searchlight beam and entirely doing away with light spillage on the deck that with all other bulbs partially blinds the pilot.



Type 1008

8" diameter housed reflector searchlight for larger craft. Patented Pilot-House instant one hand lever control. Searchlight range: one mile.

Light can be revolved in a complete circle at any angle up or down. Point the handle in desired direction. Switch in handle. Ideal for locating landmarks and moorings. Operates from boat's regular power line, or a separate battery. Friction device holds the light in any position regardless of vibration. Special triple plated precision parabolic reflector projects a two-mile beam of maximum brilliancy. Construction is of the best, with brass and bronze castings and stampings throughout, heavily chromium plated—or full polished brass and bronze. Rustproof, Weatherproof. Height above deck: 15½ inches. A No. C76 6-volt bayonet base super bulb is used with this light.

## MARINE LIGHTS



TYPE F5  
HIGH POWER "PORTALITE"



Finest dry-battery light made. For general use. Mile range. Powerful searchlight beam for 8 continuous hours or a moderate work light for 24 hours—much longer in usual intermittent use—with each battery. For many users one battery lasts a year. Bulb (No. 27-C); Reflector 6" diameter. Uses either 6½- or 7-volt Burgess or Eveready Hot Shot Batteries. Specify type of battery to be used in order that correct battery clamp may be supplied.

TYPE TNT — 2-WAY MASTER-LIGHT FOR TELEPHONE AND PUBLIC UTILITY REPAIR CREWS, FIRE DEPARTMENTS, ETC.



5-inch beam and flood reflectors. Gives a 10-foot spot of even light at top of a 40-foot pole or an adequate work floodlight. For fire departments one white beam light and one red warning light can be supplied if specified when ordering. Uses two No. 6 or telephone type dry cells. Range one-fifth mile, 11 inches high, sturdy, rust-proof, steel case, heavily enameled. Focussing knob for changing intensity and size of spot. Complete with tilt-up holder.

# DRY BATTERY PORTABLE HANDLIGHTS



TYPE DB-2  
2-CELL HANDLIGHT

For all purposes requiring a powerful rugged long-service unit. Focussing button. Rubber guard protects lens. Projects 1/8-mile beam. 5-inch reflector of highest quality. A superior high power light not to be confused with chain store lanterns.



TYPE J24 — LANTERN FOR  
RUGGED EMERGENCY LIGHTING  
Standard for Years

The trusty emergency 2-cell lantern. Unusually strong, yet light in weight. Made from cast aluminum. Gives a powerful beam of light with a wide spot. Focussing screw. Waterproof. Uses two No. 6 dry batteries. Complete with rubber lens guard. (Hanging bracket supplied at additional cost.) Uses No. 23-C bulb.



# UTILITY LIGHTS



## RECHARGEABLE BATTERY LIGHT TYPE SUPER-6 AND SUPER-4 MASTER-LIGHT

Powerful units for emergency crews, fire, police and general use. Weight always directly under hand — tilt beam any height by tipping fingers without "cocking" arm — easy to handle. Mile range. Highly polished, substantial and attractive. Powerful searchlight for 8 hours or moderate work light for 24 hours continuously — much longer intermittently — per battery charge.

The Super-6 is semi-nonspillable, uses a 6 volt 20 amp. battery, and a No. 26-C bulb. Reflector: 6" diameter; Size 13" high x 10" x 6". Weight 11 lbs.

The Super-4 is absolutely non-spillable — it can be inverted. Practically identical with the Super-6 except somewhat smaller battery and about half the burning hours per battery charge. Same size. Weight 9 lbs. Uses No. 24-C bulb.

Both these units are supplied complete with battery. Running board holder, and smoke and fog penetrating lens can be supplied at additional cost.



## TRENCH, MANHOLE AND GENERAL UTILITY LIGHT —TYPE DU WORK-MASTER

A floodlight for 100-foot circle. (Searchlight reflector for mile range can be substituted at no extra cost.) Brilliant light for over 20 continuous hours or moderate work light for 80 hours — longer, as usually used intermittently with each battery charge.

Battery: 6 volt, 85 amp. rechargeable, long life. Bulb (No. 27-C); special double filament. One switch operates both high and low power. Reflector: 6" diameter. Size: 16" high x 12" x 7". Weight: 40 lbs. Supplied complete with battery.



## NON-SPILLABLE RECHARGEABLE TYPE G-23 MASTER-LIGHT For Watchmen, Patrolmen, Firemen

Feather Weight: — only 4 3/4 lbs. complete. Using Watchman's filament provides 15 hours or all night continuous light per battery charging — or using emergency high power filament 8 continuous hours — much longer as usually used intermittently. Beam of 25,000 c.p. Range one-third mile. Battery: 2 volt, 21 ampere hour, FULLY non-spillable even if inverted. Corrosionproof. Automatic filling control. Rechargeable. Long life. (Spare batteries can be inserted in 10 seconds' time.)

Reflector: 5" diameter, TRUE parabolic, fine grade silver plate. Bulb: (No. 23-C) Double filament, high and low power. Height: 9 1/2 in. Shoulder strap or running board holder supplied at additional cost.



## EXTENSION LIGHT TYPE LX MASTER-LIGHT

General Utility Light for Manhole Work, Repair Trucks, Motor Boats, Police Cars, etc.

A powerful convenient one-mile searchlight. Operates from car or any battery or other electric current. (If specified a floodlight reflector illuminating 10,000 sq. ft. will be substituted at no extra cost.) Supplied complete with 15 feet of cord.





TYPE T3 PISTOL GRIP  
GEARLESS CONTROL  
AUTOMOBILE  
ROOFMASTER



For passenger and patrol cars, repair cars, buses, trucks, etc. Everyday and emergency uses. Standard with highway patrols, where a powerful easily controlled light without "blind" spots is necessary. Used on repair cars and wherever superior lighting is required. Specify voltage. Diameter 6 1/8", beam of 80,000 c.p. Uses sealed beam bulb. Semi-chrome finished.

TYPE SB  
POWERFUL  
SUPERIOR  
QUALITY  
STANCHION  
LIGHT



Search or flood-light — for vertical or horizontal mounting on fire trucks and emergency cars. Highest quality throughout. Can be pointed in any direction. Projects an 80,000 c.p. beam.

## ROOF-MOUNTED AUTOMOBILE SEARCHLIGHTS

### MASTER-LIGHT BATTERY CHARGER



Keep Master-Lights always ready for top performance.

Measures only 3" x 4" x 5" high. Attractive crinkle finish. For 110-120 volt 60 cycle AC operation.

Also available is a control for charging Master-Light batteries direct from automobile battery charger and a Master-Light ball-float hydrometer.

(Write for instructions for charging from automobile generator or from DC current.)

Rechargeable batteries are supplied with the Super-6, Super-4, Type DU, F5 and Type G-23. All other models use No. 6 dry cell batteries.

### BATTERIES AND BULBS

Bulbs. When ordering replacements specify for which light.

# Northern Electric

COMPANY LIMITED

HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA  
VAL D'OR TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
PORT ARTHUR WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA

August 1947-L-12-14  
10M-8-47





NOR-ELECTRIC



BULLETIN

# APPLETON REELITES



**TAKE-UP REELS FOR ELECTRIC CABLE AND PORTABLE TOOLS**

**MOTOR-DRIVEN, CONSTANT DUTY AND PORTABLE TYPES**



## CONSTANT DUTY REELITE — TYPE "SR"

SPRING-DRIVEN CABLE LIFT REEL



For Type SJ Cords

Rating—20 Amperes, 300 Volts

Catalogue Number	Number of Conductors	Weight of Reelite Only	
SR-21	2	12 lbs.	Maximum capacity, 25 feet of No. 18 or No. 16 two or three conductor cord
SR-31	3	12 lbs.	

### CONSTRUCTION FEATURES

Constant Duty Reelites were developed and designed to meet varied requirements and operate equally as well whether used for light or heavy duty. All important reel units are cast of heavy material especially chosen for its durability. The use of ball bearings throughout eliminates undue wear and provides a lifetime of easy, trouble-free reeling.

The motive power of the Reelite is furnished by the highest quality clockspring obtainable and produced especially for cable reel service. These springs are housed in a dust-tight, grease-filled compartment and require no maintenance or further attention. Through the use of a ratchet clutch, spring breakage is eliminated when a high backward momentum carries the spring beyond its normal stopping point.

### CABLE OUTLETS FOR CONSTANT DUTY REELITES



**Swivel Type**

Recommended where cable must be drawn at right angles to drum. Swivel range must be confined to 225 degrees or less.



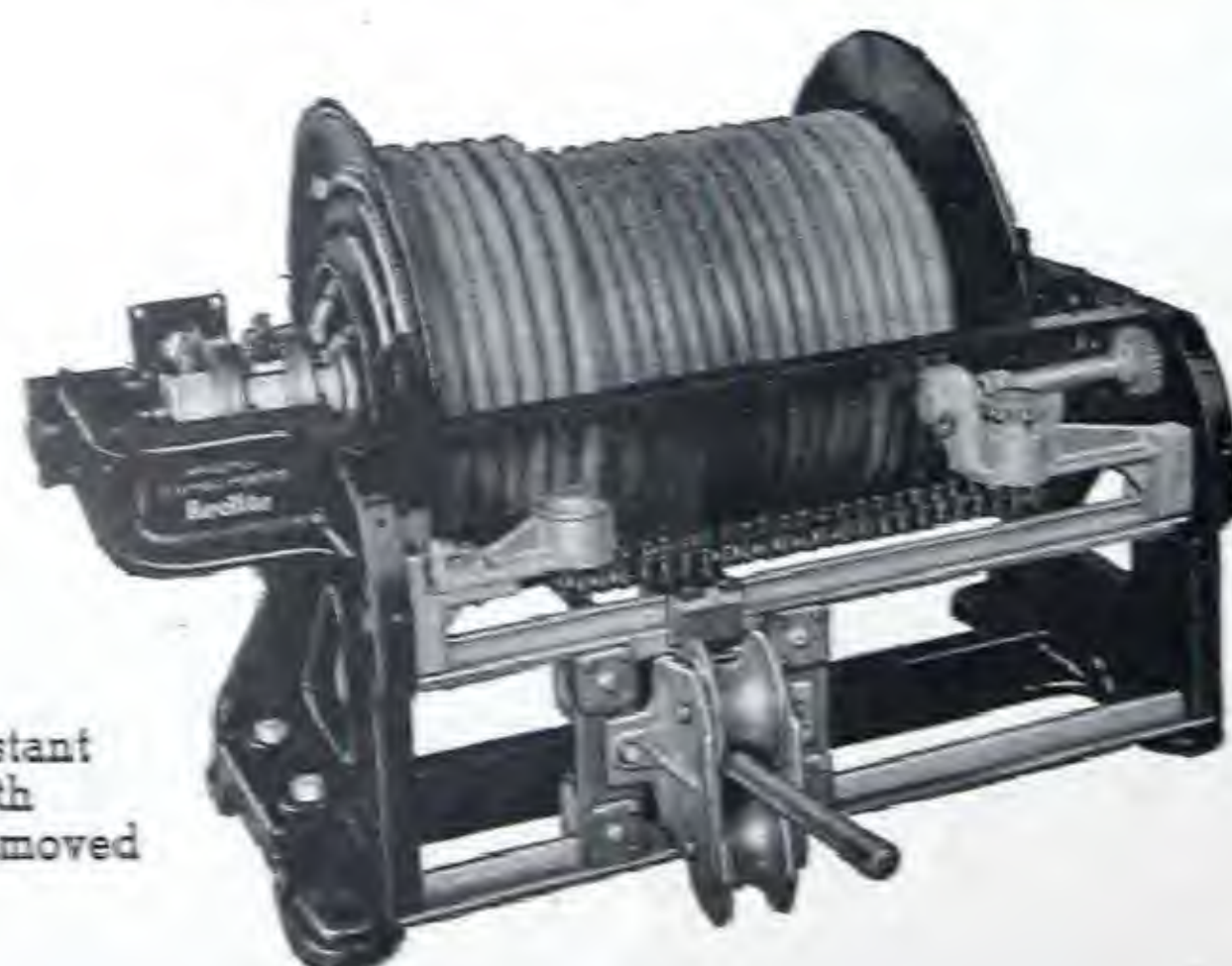
**Guide Roller Type**

A general purpose outlet used where cable is drawn tangent to drum. Cable must not be drawn around rollers.



**Large Roller Type**

To be used only with straight track operation where current source is at mid-point of runway.



Type GW Constant Duty Reelite with Front Shield Removed

## CONSTANT DUTY REELITE

SPRING-DRIVEN TAKE-UP REEL—WITH CABLE DISTRIBUTOR

Type GW Rating—100 Amperes, 600 Volts

#### WHEN ORDERING SPECIFY —

1. Catalogue number of Reelite.
2. Length, gauge and number of conductors of cable.

#### MOUNTING

Reelite MUST be mounted on MOVING machine with cable outlet not more than 3 feet above ground. Reelite only takes up cable as machine approaches source of current supply.

#### CABLE DISTRIBUTOR

A synchronous cable feeding device which piles cable in neat even layers on reel drum.

#### MATERIAL AND FINISH

Cast Aluminum and Steel. Finished in Black enamel.

Catalogue Number	Weight of Reelite Only	Number of Conductors	Maximum Capacity, in Feet, of Various Sizes and Conductors of Rubber-Covered Cable				
			No. 6	No. 4	No. 3	No. 2	No. 1
GW- 24	360 lbs.	2	...	130	130	120	80
GW- 34	362 lbs.	3	...	130	120	120	80
GW- 44	364 lbs.	4	...	130	110	80	...
GW-210	614 lbs.	2	320	340	350	360	250
GW-310	616 lbs.	3	330	350	360	310	240
GW-410	618 lbs.	4	340	360	300	250	—



## RETRACT-O-REEL



The Retract-O-Reel is a light-weight all cast aluminum balancing reel used for supporting portable tools, air and electrical devices weighing up to 10 lbs. Reels support light-weight drills, screw-drivers, assembly tools, etc., directly over production line while operator is otherwise engaged.

Spring tension is adjustable although balance point is set at factory according to weight of tool to be balanced. The Retract-O-Reel embodies the following features:—

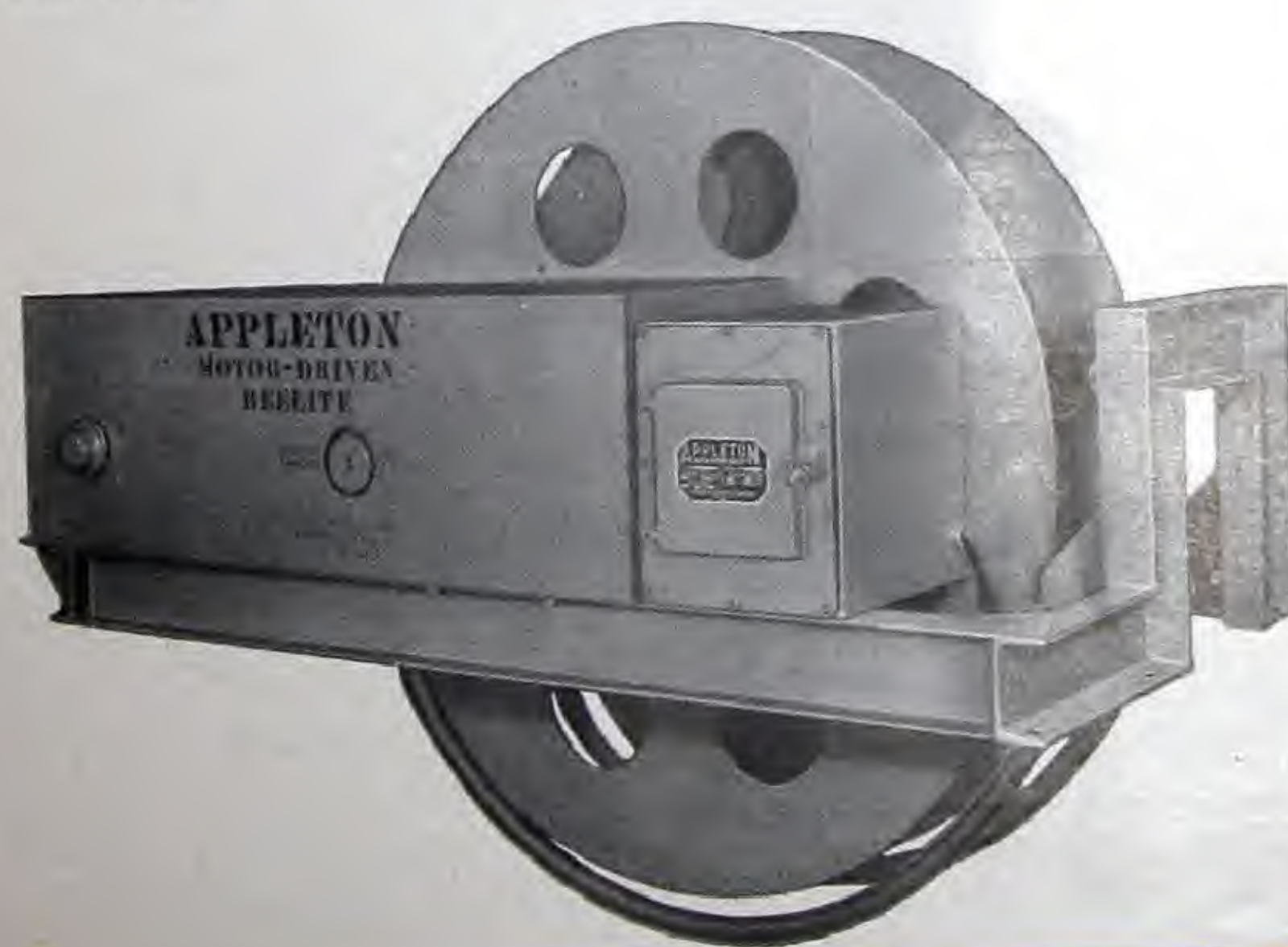
1. The Retract-O-Reel is streamlined in design and made of cast aluminum.
2. The newly designed wire grip stopper employs a wedge type principle of gripping, which insures extra long life for the wire rope, while assuring a positive grip — no set screws to injure or break the wire rope even with constant operation.
3. The end of the wire rope is furnished with an eye loop made of a swaged-in thimble, permitting quick tool connection.
4. The Retract-O-Reel turns on self-lubricated oil-less bearings.

**FURNISHED WITH 6 FEET, PREFORMED WIRE ROPE, RUBBER BUMPER, CABLE CLAMP, AND THIMBLE IN SWAGED EYE LOOP**

Catalogue Number	Weight of Tool to Be Balanced—Lbs.		Active Rope Maximum Working Range in Feet	Inactive Rope Minimum Length in Feet Outside Reel Drum	Net Weight Each
	Maximum	Minimum			
<b>B21- 51</b>	5	0	6	0	6 lbs.
<b>B21- 71</b>	7	5	6	0	6 lbs.
<b>B21- 81</b>	8	7	5	1	6 lbs.
<b>B21-101</b>	10	8	1½	4½	6 lbs.

## MOTOR-DRIVEN REELITES

The Motor-driven Reelites are to be used in a definite field where the use of spring-driven equipment is not practical. This field covers situations where excessive cable lengths prohibit the use of springs, where heavy gauge cables are to be taken up under constant tension, and where it is more economical to use portable drag cable in preference to other current distribution processes. As each motor-driven application is more or less built to order, no standard equipment is available at present. All inquiries for this equipment should include:



1. Maximum travel of moving machine.
2. Complete cable specifications.
3. Duty cycle of machine.
4. Power supply specifications.
5. Control of torque motor (manual or automatic).
6. Type of motor frame (open or enclosed).
7. Dimensional limitations (if any).
8. Rough sketch showing mounting of Reelite on machine with cable lead to ground.

Special framework may be supplied where unit is to be built into the design of gantry and other type cranes and machines.



## Portable Type Reelites

RATING—250 Volts, 600 Watts



The Portable Type Reelite is an automatic reeling device for extension light cords. The light is always available within arm's reach and no time is lost in untangling cords or plugging in for new extensions. As the cord is neatly reeled up, accidents are not likely to occur and cord maintenance costs are cut to a minimum. Thousands of Portable Reelites are in daily use in stores, warehouses, stock rooms, etc., for properly illuminating dark corners where ceiling light seldom penetrates.

Each reel has a ratchet stop which works exactly like a window shade. The cord may be set at any desired length without holding against the tension of the reel. Portable Reelites are furnished standard with a cover plate which fits all 3 1/4" or 4" Octagonal Outlet Boxes. Finish is light grey enamel.

### PORTABLE TYPE REELITES—FURNISHED WITH No. 16 GAUGE, 2 CONDUCTOR CORD

Length of Cord	Diameter of Reelite	Weight Lifting Capacity	Catalogue Number	Description	Weight per Dozen
12 feet	5 1/2"	2 lbs.	1532	Without Wiring Device.....	50 lbs.
			1533	With Brass Shell Key Socket.....	61 lbs.
			1534	With Composition Key Socket.....	62 lbs.
			1524	Without Wiring Device.....	93 lbs.
25 feet	7 1/4"	1 1/2 lbs.	1525	With Brass Key Socket (Less Guard).....	94 lbs.
			1526	With Composition Key Socket (Less Guard).....	97 lbs.
			1530	Grounding Type without Wiring Devices. Furnished with No. 16-3 conductor cord, 2 of which are connected to brushes and third grounded to frame.....	95 lbs.
			1519	Without Wiring Device.....	150 lbs.
40 feet	10"	1 lb.	1520	Without Wiring Device.....	160 lbs.
50 feet	10"	1 lb.			

### MACHINE TOOL TYPE

This Reelite is equipped with a connector body so that any portable electrical tool or device can be attached.



CORD—25 feet; No. 16 gauge, 2 conductor.

DIAMETER—7 1/4 inches.

MOUNTING—Ceiling, to Standard 3 1/4" or 4" Octagonal Outlet Boxes

FINISH—Light grey enamel.

Catalogue No.	Weight per Dozen
1523	97 lbs.

### VAPORPROOF TYPE

Furnished with Vaporproof Globe, Heavy Duty Wire Guard with Plastic Handle. Will accommodate standard lamps up to and including 60 watt.

CORD—20 feet; No. 16 gauge, 2 conductor

DIAMETER—7 1/4 inches

MOUNTING—Ceiling, to Standard 3 1/4" or 4" Octagonal Outlet Boxes

HANDLE—Plastic

GUARD—Heavy duty wire

FINISH—Light grey enamel



Catalogue No.	Weight per Dozen
1509	144 lbs.

# Northern Electric

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HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA  
VAL D'OR TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
PORT ARTHUR WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA



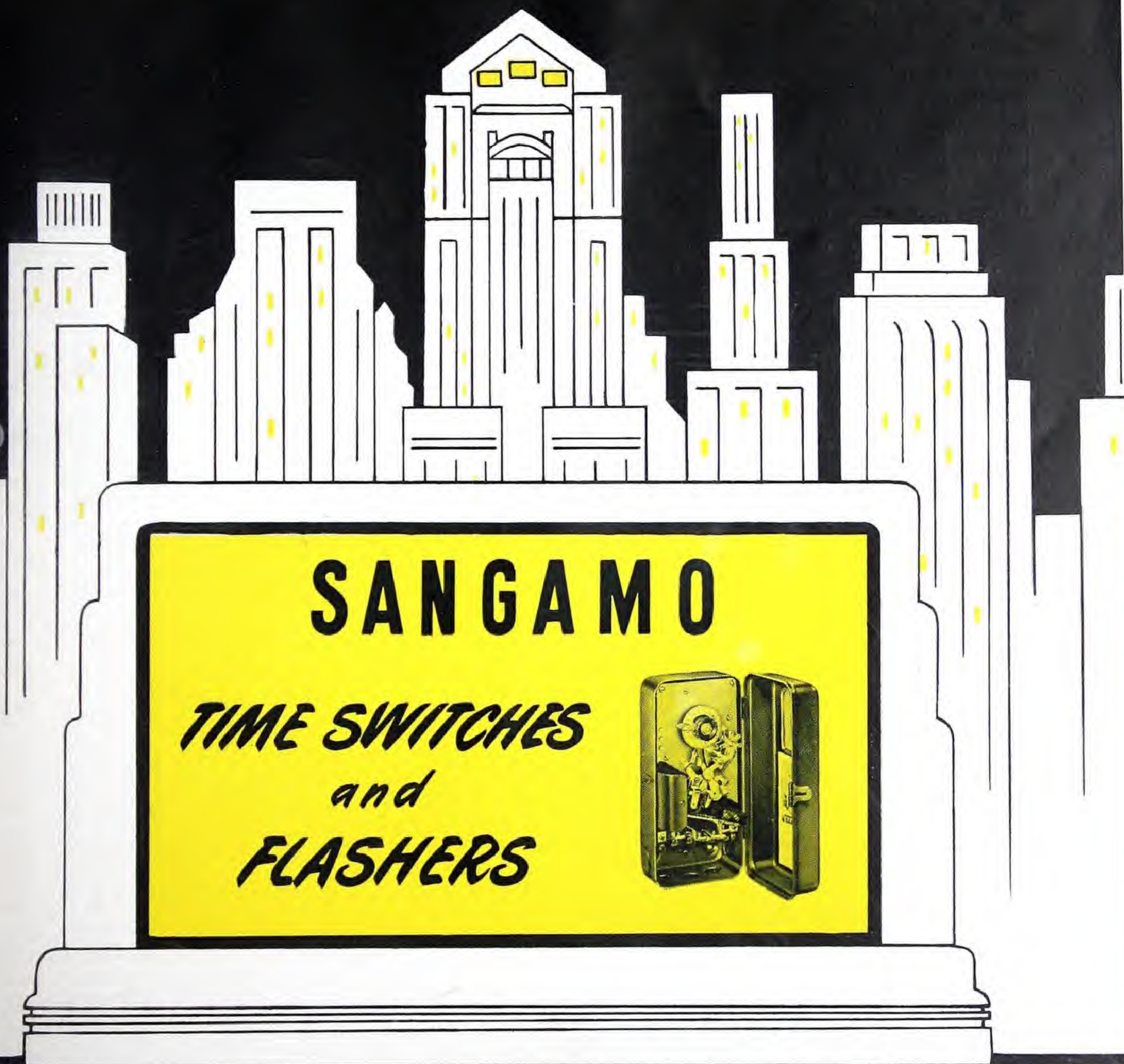


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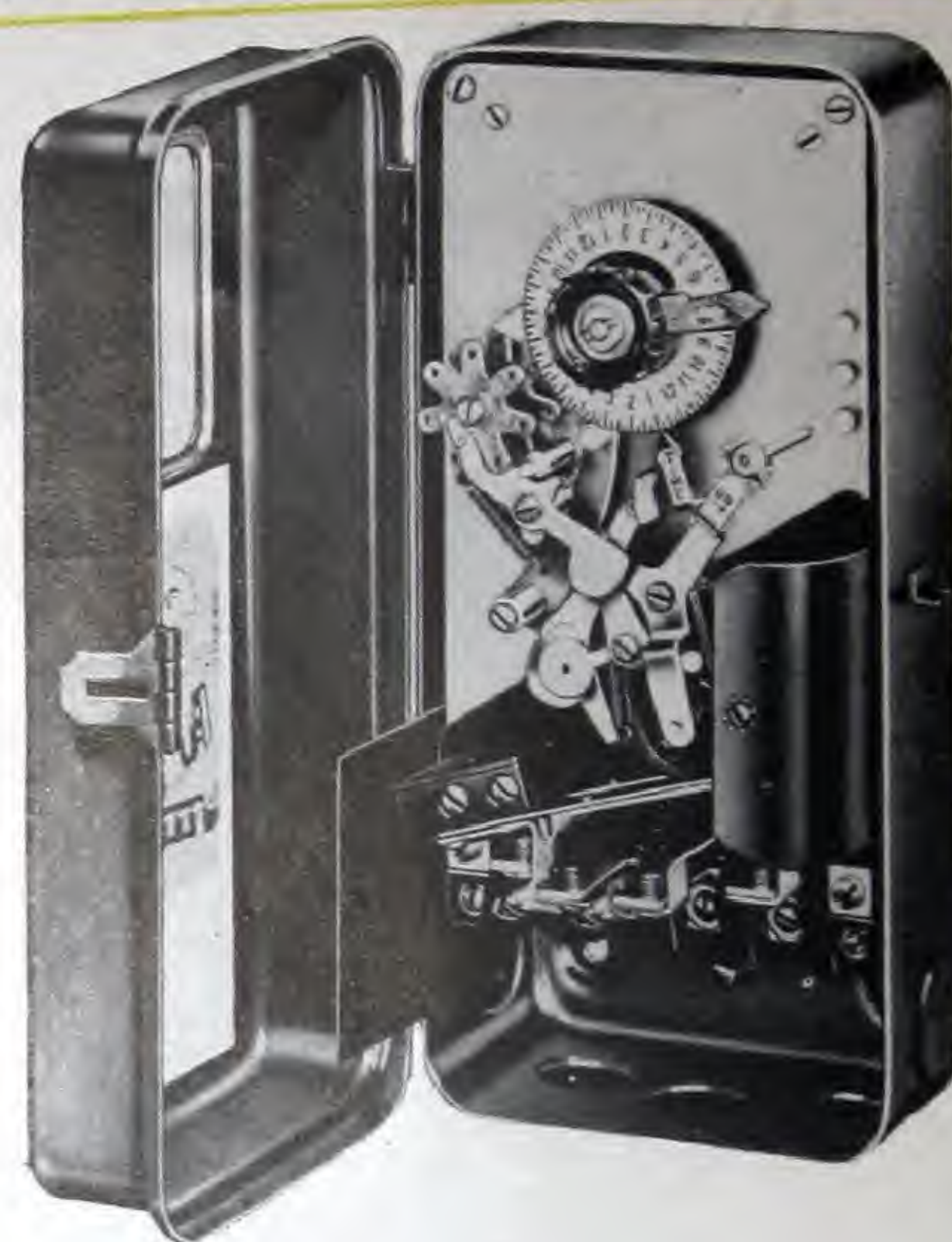
A SIGN OF GOOD CONTROL



## Model B — Form KAH

### Synchronous Motor — Alternating Current

The Model B Time-Switch, in the Form KAH with self-starting synchronous motor, is built in a wide variety of combinations from the simple single-pole, single-throw, to the triple-pole, double-throw. This type covers the entire field of lighting and thermostatic controls. The basic time-switch unit is used in the other combinations providing outdoor, and astronomic dial time-switches. The motor and all reduction gears are assembled and held in place by two nickel-plated train plates. The contact mechanism and connection block are mounted on a front mounting plate. The mounting plate is then securely fastened to the front train plate, and a dust pan completely encloses the whole train plate unit so that the motor and all gear reductions are further protected by this dustproof enclosure. A window with a transparent cover is directly over the motor.



### Specifications

**Motor**—Low-speed, high-torque, self-starting, 240 R.P.M. at 60 cycles and proportionately on other frequencies.

**Pure Silver Contacts**—Mechanical contacts conservatively rated at 35 amperes, are used on the simpler switches.

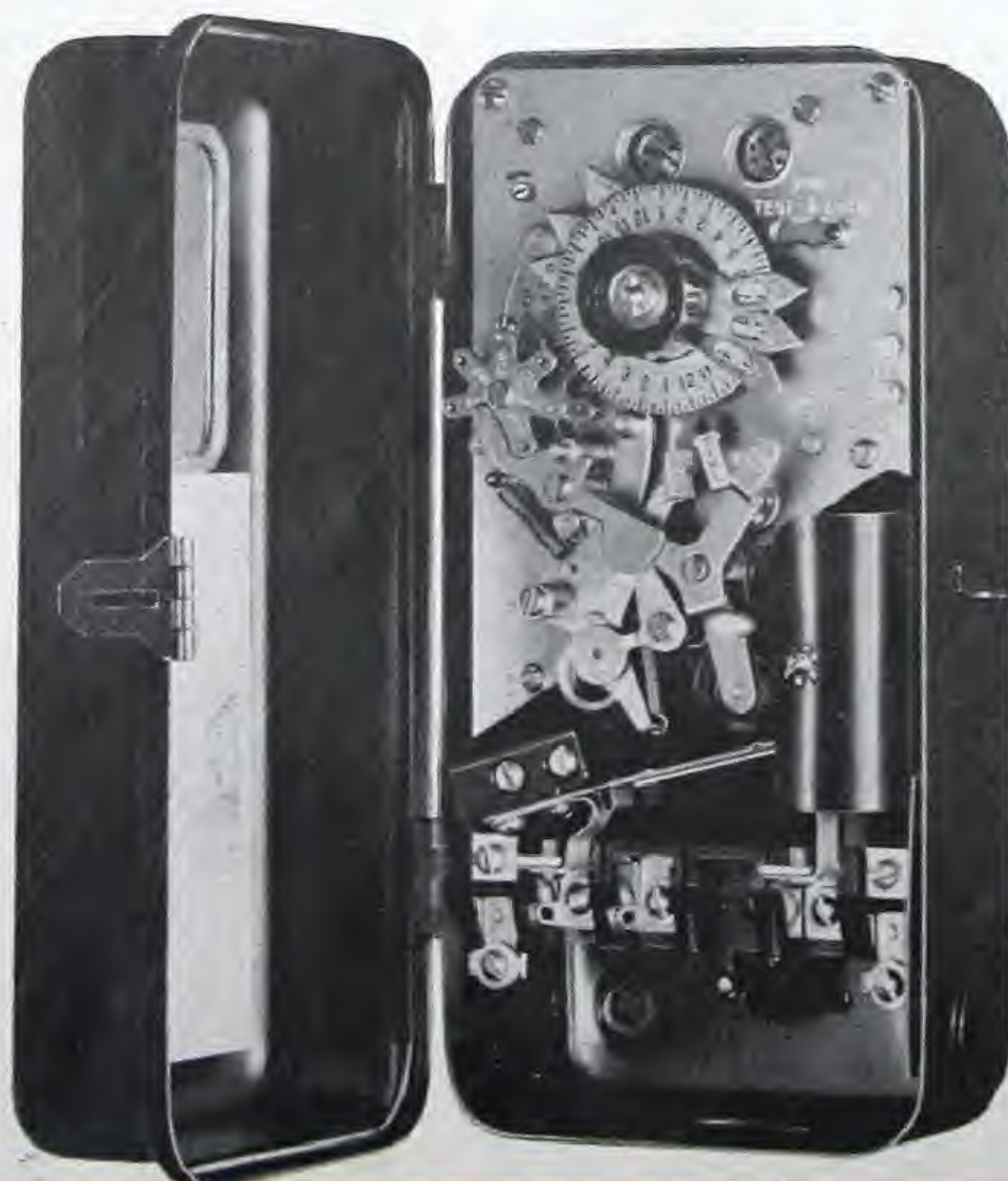
**Frequency of Operation**—The 24-hour dial has three pairs of operating levers, allowing for one, two or three "on" and "off" periods per day. Minimum time period between "on" and "off" operations, 30 minutes; between "off" and "on", two and one-half hours. For reverse time limits add the code letter G.

**Manual Operation**—Either "on" or "off" levers can be tripped manually without affecting the sequence of subsequent operations.

**Dust-Proof Case**—The pressed steel case is rust-proofed and painted black. A  $\frac{3}{4}$ " pryout is supplied in back, bottom and both sides.

**Omitting Device**—The omitting device omits the "on" operation for the period of time selected. Three pins are provided so that either one, two or three different days per week can be selected. The front plate is drilled and tapped to hold the pins when not in use.

**Micrometer Adjustment**—This time-setting device assures accuracy in resetting time-switch should power failure occur.



## Model B — Form VSW

### Synchronous Motor — Carryover Time-switch — Alternating Current

The Model B, VSW Time-Switch combines the advantages of synchronous timing with reserve spring clock operation, providing continuous operation, during current interruptions of 10 hours or less. Except during current interruptions, the switches are driven by the synchronous motor, providing the exceptional accuracy of modern frequency controlled systems. Then during current interruptions, the spring operates the timing mechanism through a jewelled escapement, eliminating the necessity of resetting the dial after the electric current has been restored.



## Specifications

**Motor**—Low-speed, high-torque, self-starting, 240 R.P.M. at 60 cycles and proportionately on other frequencies.

**Jewelled Balance**—The electrically wound movement has a jewelled balance and a non-magnetic, non-rusting, temperature compensating hairspring.

**Ten Hours Reserve**—The motor winds the mainspring which drives the timing mechanism during current interruptions, providing a 10-hour reserve.

**Pure Silver Contacts**—The mechanical contacts are conservatively rated at 35 amperes.

**Manual Operation**—Either "on" or "off" levers can be tripped manually without affecting the sequence of subsequent operations.

**Omitting Device**—On the VSW the omitting device omits the "on" operation for the period of time selected. Three pins are provided so that either one or more different days per week can be selected. The front plate is drilled and tapped to hold the pins when not in use.

**Frequency Operation**—The 24-hour dial has three pairs of operating levers, allowing for one, two, or three "on" and "off" periods per day. Minimum time period between "on" and "off" operation, 30 minutes; between "off" and "on", two and one-half hours. For reverse time limits add the code letter G.

### TIME-SWITCH — MODEL B

Specify voltage and frequency

4¼" Wide, 9¼" Long, 3¾" Deep

Shipping weight 7 Lb.

Form	No. Poles	Throw	A.C.-115 Volt Amp.	A.C.-230 Volt Amp.
KAH-11	Single-Pole	Single-Throw	35	35
KAH-12	Single-Pole	Double-Throw	35	35
KAH-21	Double-Pole	Single-Throw	35	35
KAH-22	Double-Pole	Double-Throw	6	3
KAH-32	Triple-Pole	Double-Throw	6	3
VSW-11	Single-Pole	Single-Throw	35	35
VSW-12	Single-Pole	Double-Throw	35	35
VSW-21	Double-Pole	Single-Throw	35	35
VSW-22	Double-Pole	Double-Throw	6	3
VSW-32	Triple-Pole	Double-Throw	6	3

## Outdoor Cases and Astronomic Dials

### Outdoor Cases

For outdoor installations, a heavy cast aluminum case, finished with aluminum paint, can be furnished. Ideal for outdoor signboards.

### Astronomic Dials

Efficient control of window lights, bill-boards, and street lighting can be accomplished by the use of a time-switch equipped with an Astronomic Dial. This allows "on" and "off" operations to accurately follow sunset and sunrise time.

Further details and information on these two items may be obtained upon request.

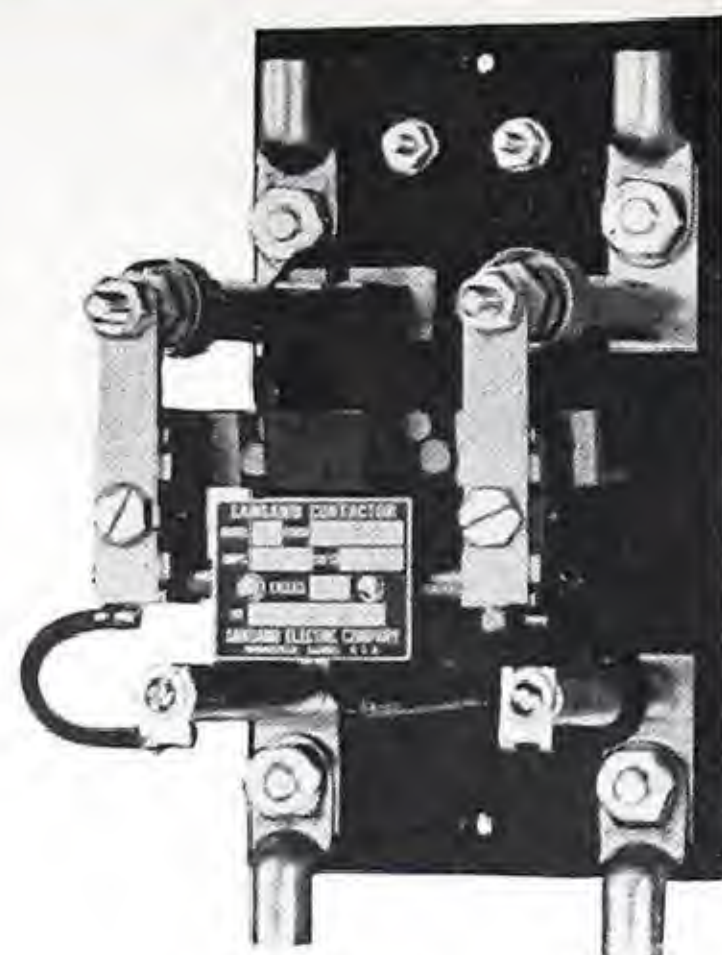


Outdoor Cases



Astronomic Dial





Model 8 Contactor

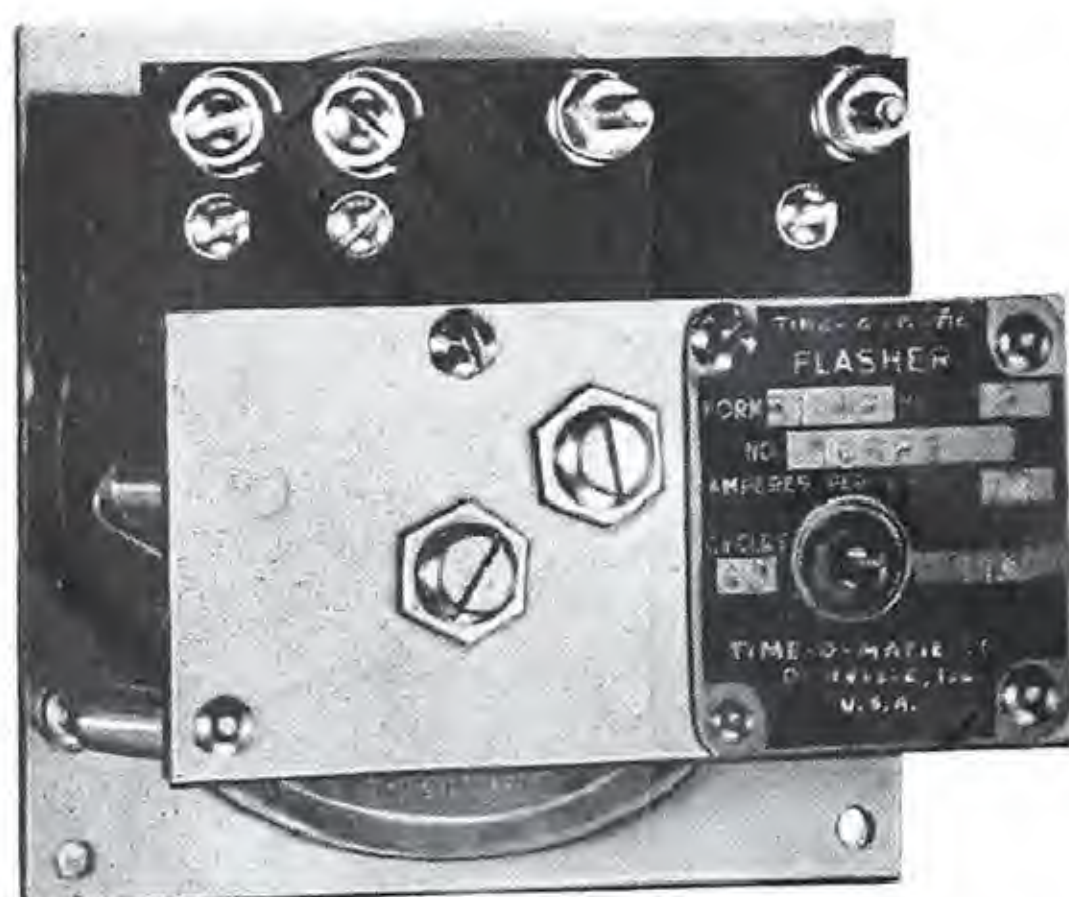
## Flashers

Only a few of the many models and types of flashes are illustrated here. Model 8 is for flashing duty where speeds do not exceed 30 operations per minute. Model 3-6101 "Off" and "On" flasher fills the need for an inexpensive, dependable flasher. Model 5-61H6 is an adjustable, speed motor driven unit for the flashing of neon-tube signs. Model 2-6144 is a small and compact unit for installation inside the sign. Model 3-61S10 speller flasher provides a reliable inexpensive flasher of the speller type. Also available is the Radio Interference Eliminator developed to reduce to a minimum the interference caused by the arcing at the contacts of the flashers.

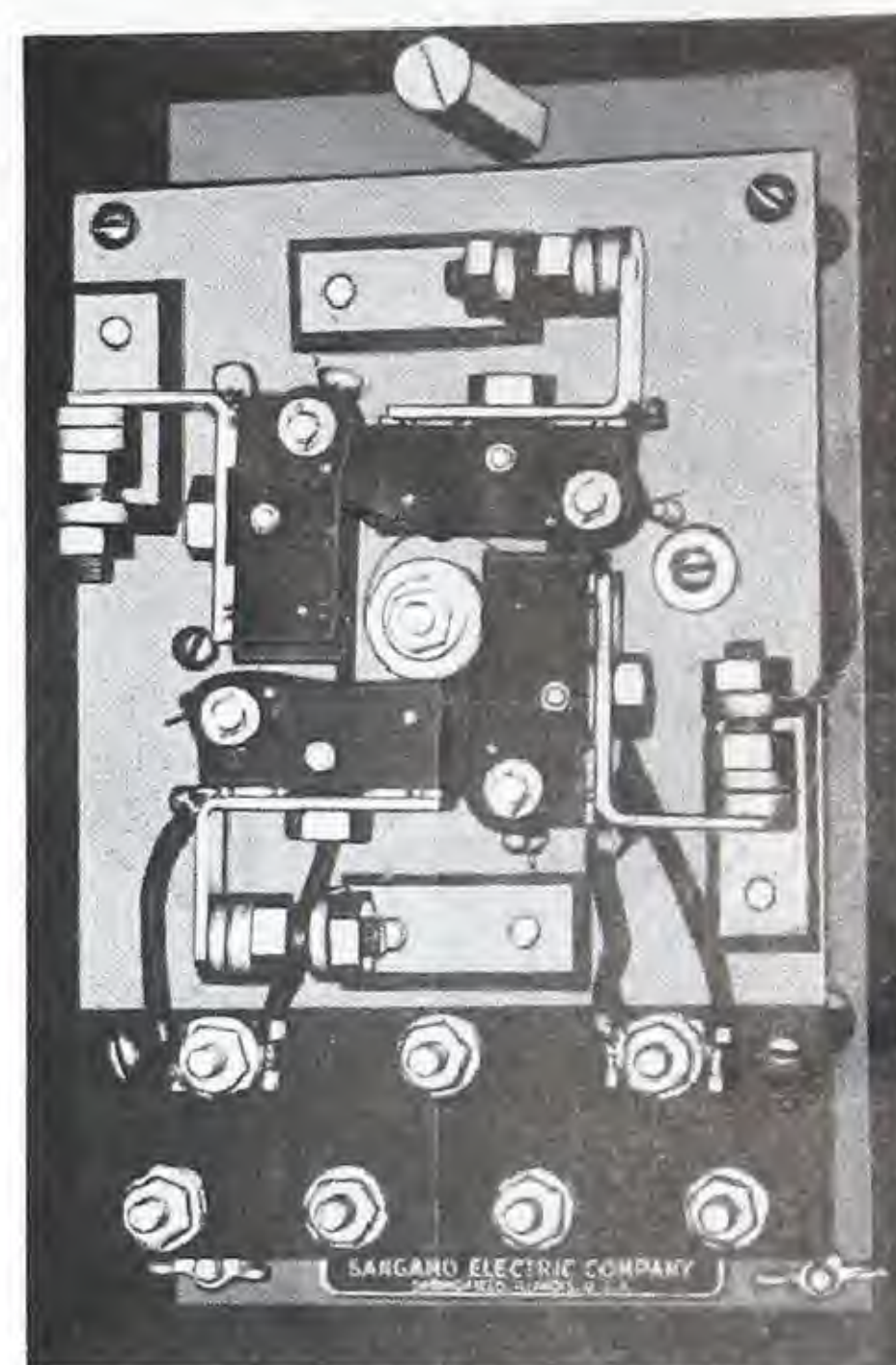
Further details and information may be obtained upon request.



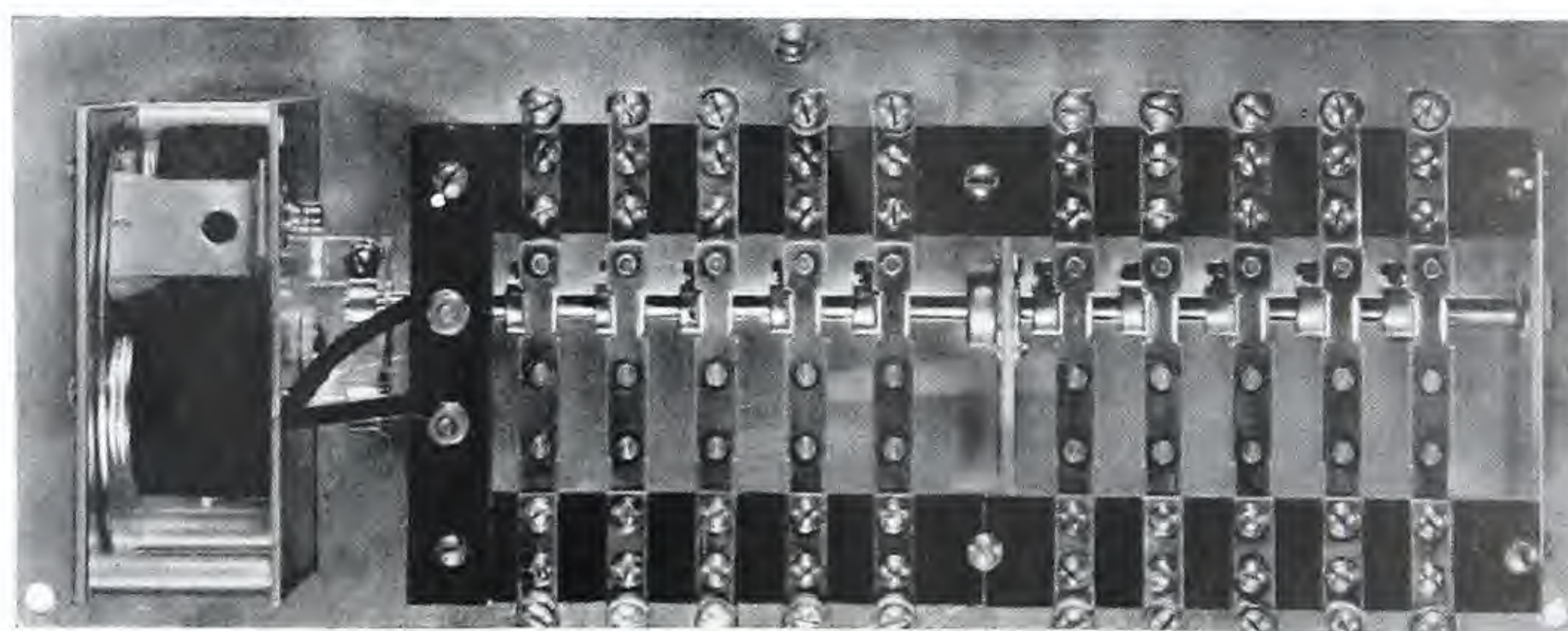
Model 5-61H6



Model 3-6101 "Off" and "On" Flasher, Adjustable Speed, One Circuit.



Model 2-6144 Four-circuit high-speed Border Chaser



Model 3-61S10 Speller Type Flasher, Ten Circuits.

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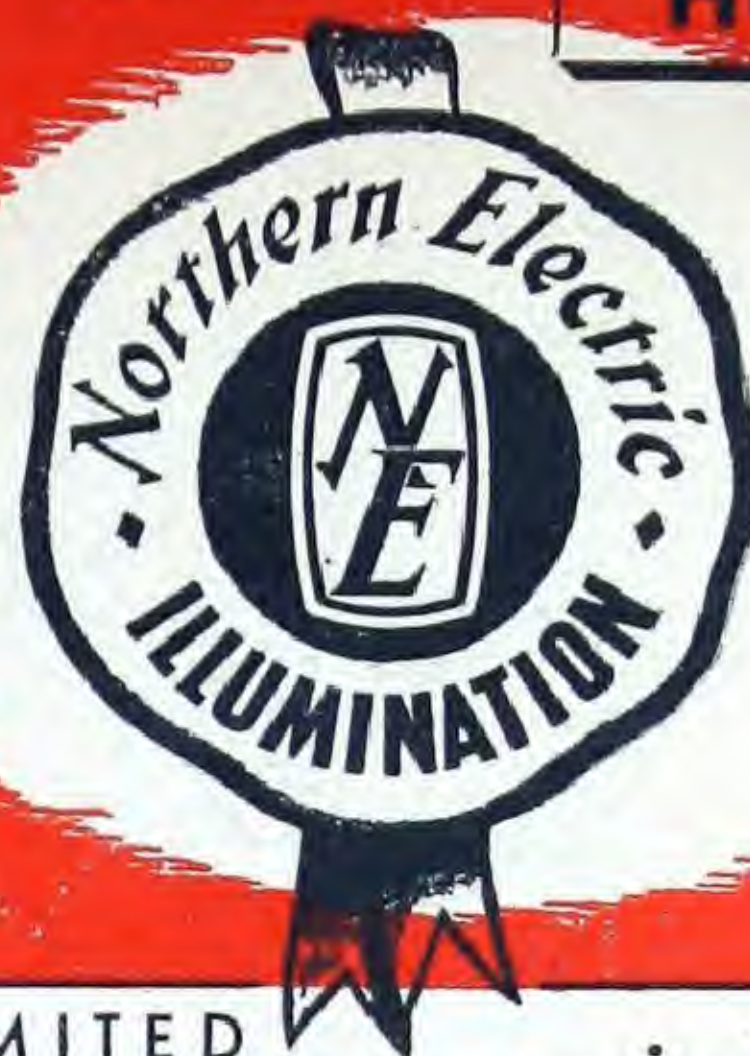
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# Nor-Lectric BULLETIN

September 1944

H-1-3



ED BY NORTHERN ELECTRIC COMPANY LIMITED

1944



## A NEW TOOL FOR

## *Quick Heating*

CLEAN, QUICK, ECONOMICAL,  
EASILY CONTROLLED

The Model LRJ is a convenient all-purpose portable Near Infra-Red unit which provides a highly efficient means of accomplishing many tasks where quick, easy, controlled heating is required. Its application to metal objects of small area develops relatively high temperatures with surprisingly short exposure. For instance, 20 gauge black metal  $1\frac{1}{2}$ " in diameter can be heated to 1000 degrees F. in  $1\frac{1}{2}$  minutes when the edge of the reflector is held  $2\frac{1}{2}$ " from the metal. The LRJ is generally recognized as cleaner, safer and quicker than open-flame heating.

### INSTRUCTIONS FOR USE:

The size of the heat pattern made by the reflected rays determines the intensity. When the reflector is held close to the object, the rays are converged on a small spot for maximum heat intensity. This intensity lessens as the distance from the object is increased. The proper distance the unit should be held in order to obtain required results in any heating operation may be determined by test. The reflecting surface of the Fostoria unit is gold-plated and requires occasional cleaning with good quality rouge to maintain full reflecting efficiency.

The 400 watt, 115 volt, G-30 clear drying lamp is recommended. The 250 watt, 115 volt, G-30 clear drying lamp may also be used. Always use G-30 lamps to maintain correct focal position.

### MODEL LRJ

FOSTORIA  
INFRA-RED UNIT

### SUGGESTED USES

Here are a few of the quick heating operations which can be handled speedily and efficiently with the handy LRJ Near Infra-Red Units:

- Melting or flowing grease, pitch, oils, fats, syrups, etc.
- Preheating small metal parts to secure shrink-fit.
- Rapid drying or drying off of moisture or liquid coats.
- Touch-up paint finishing.
- Thawing frozen oxygen regulators.
- Thawing frozen pipes.

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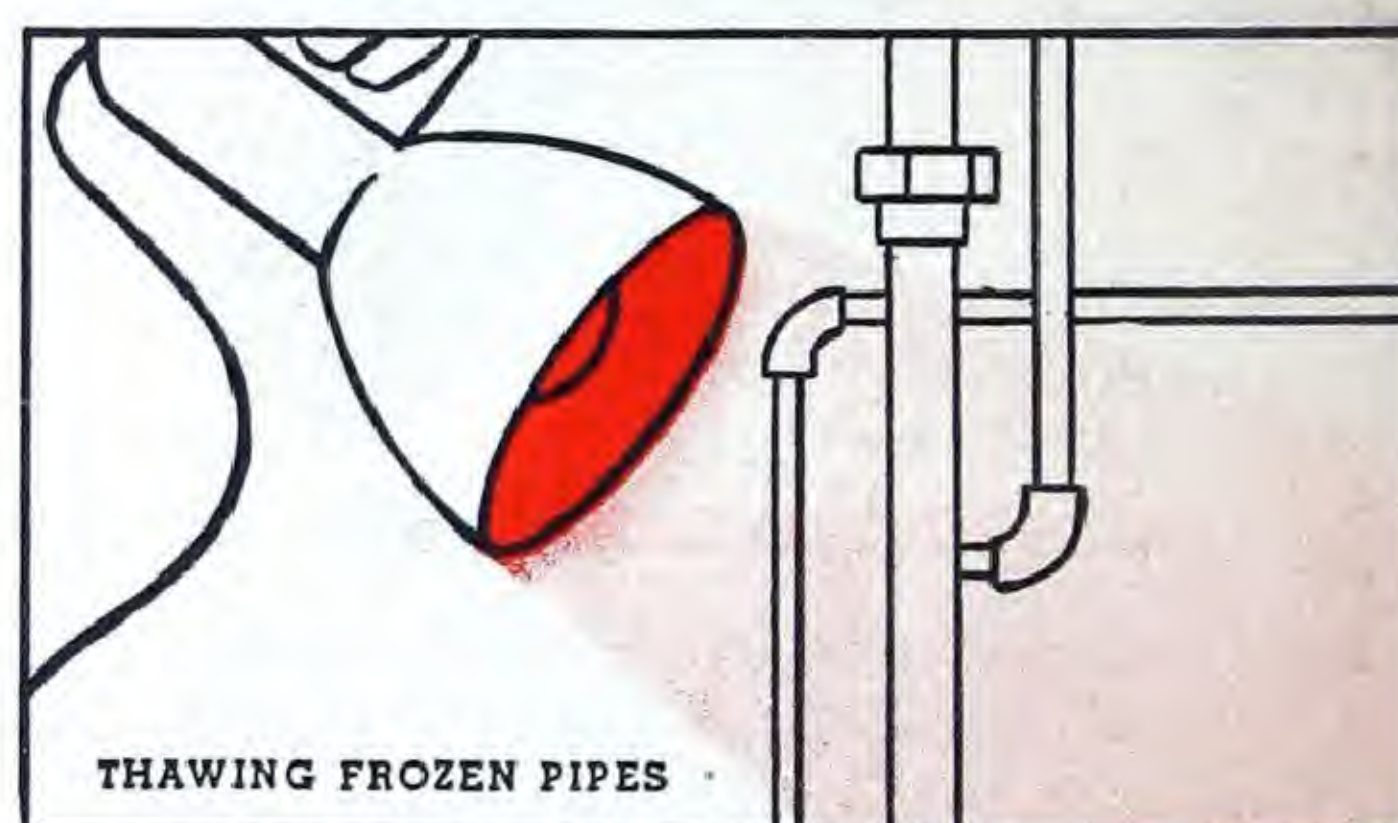
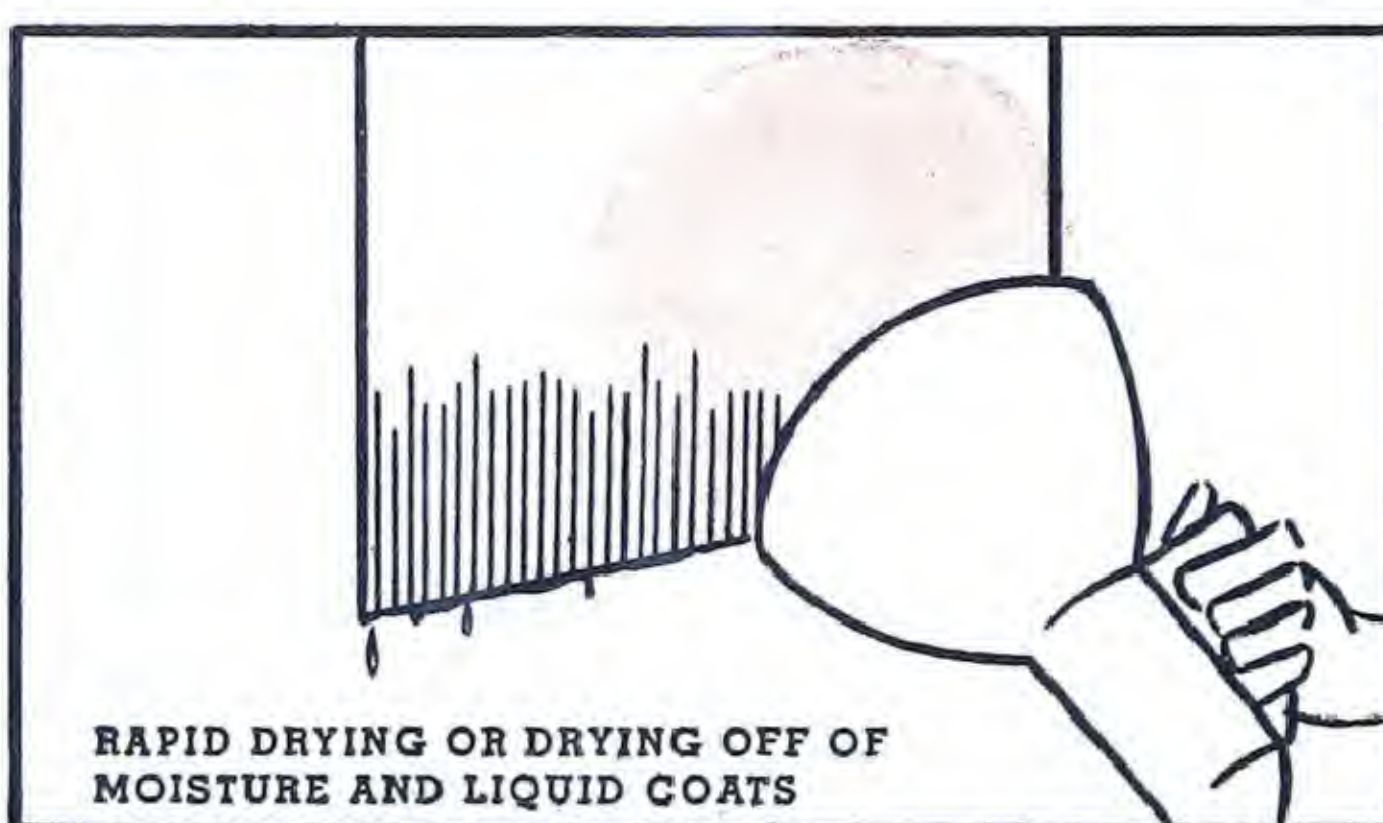
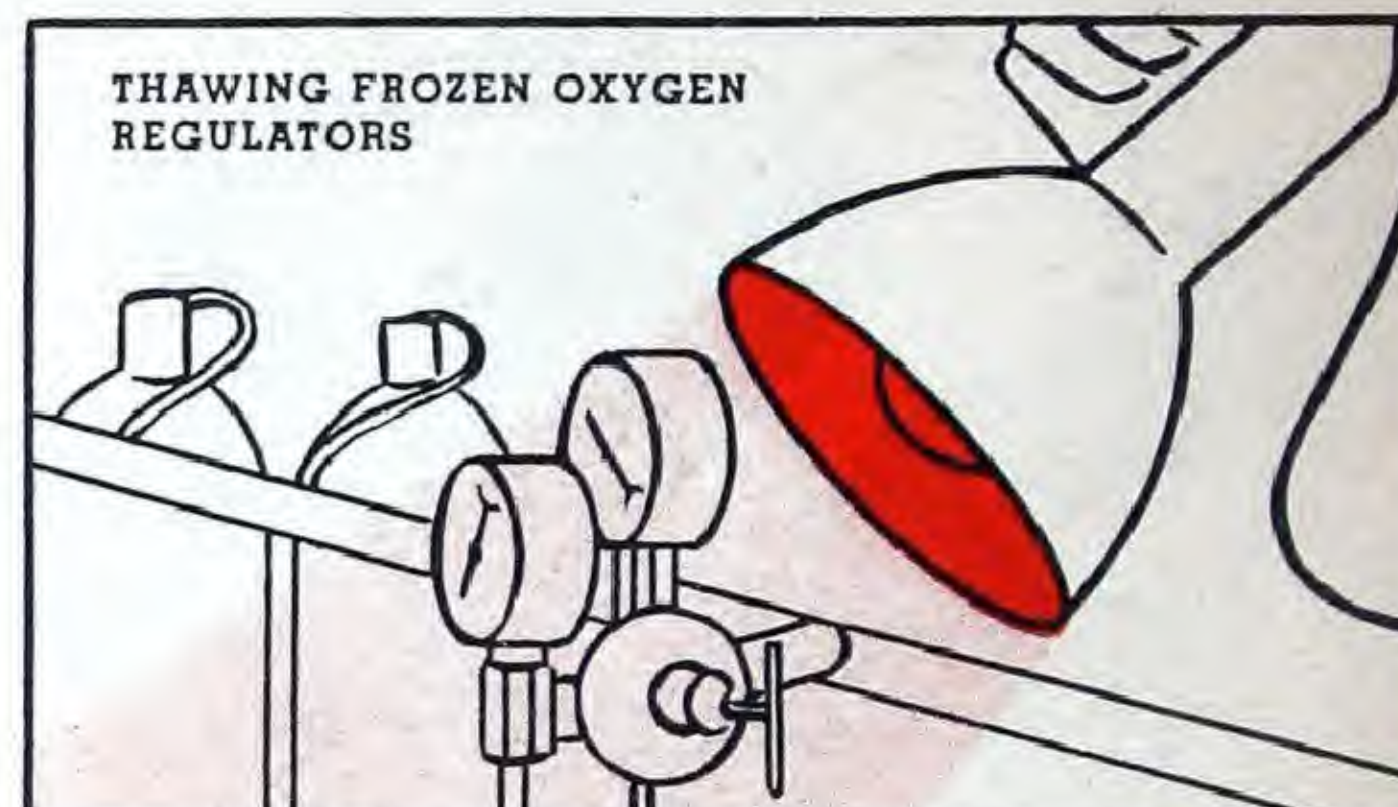
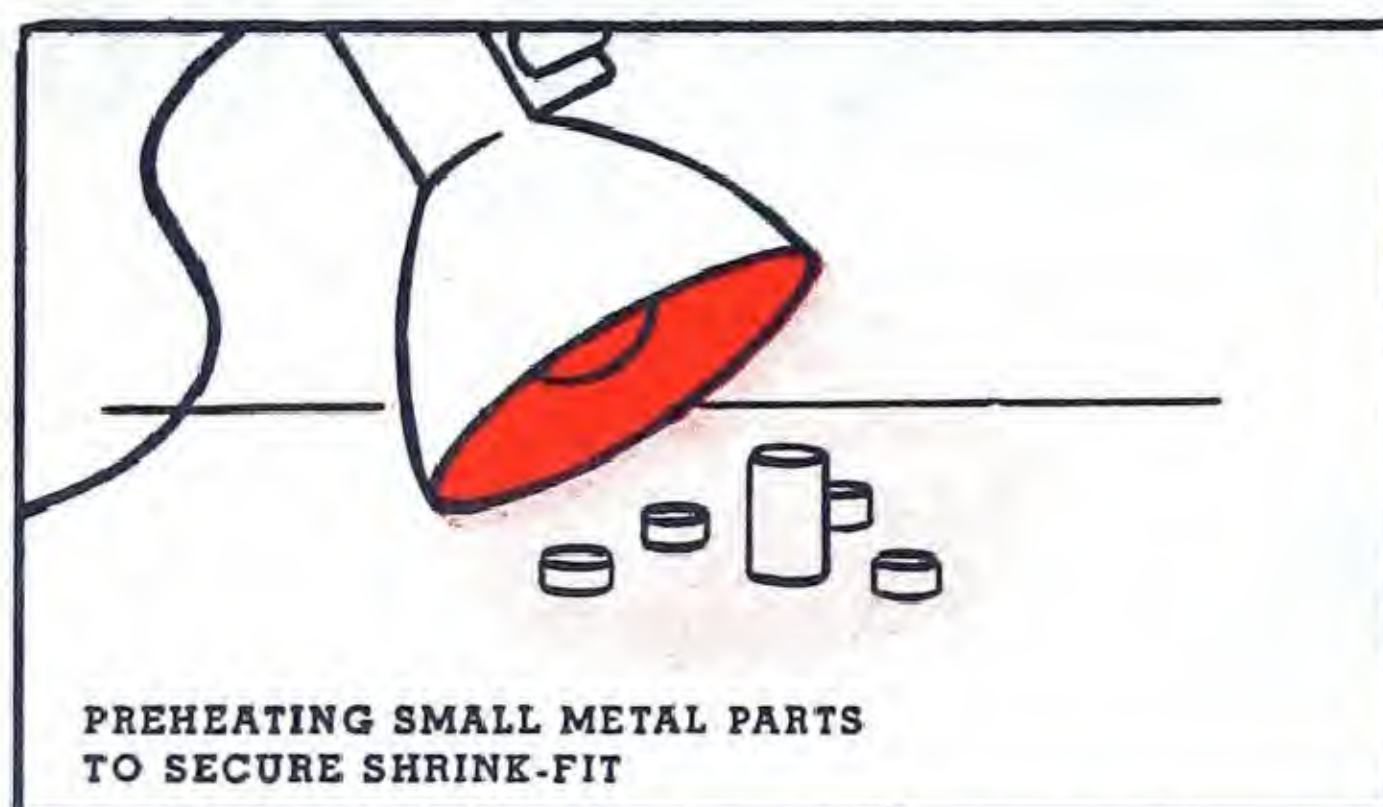
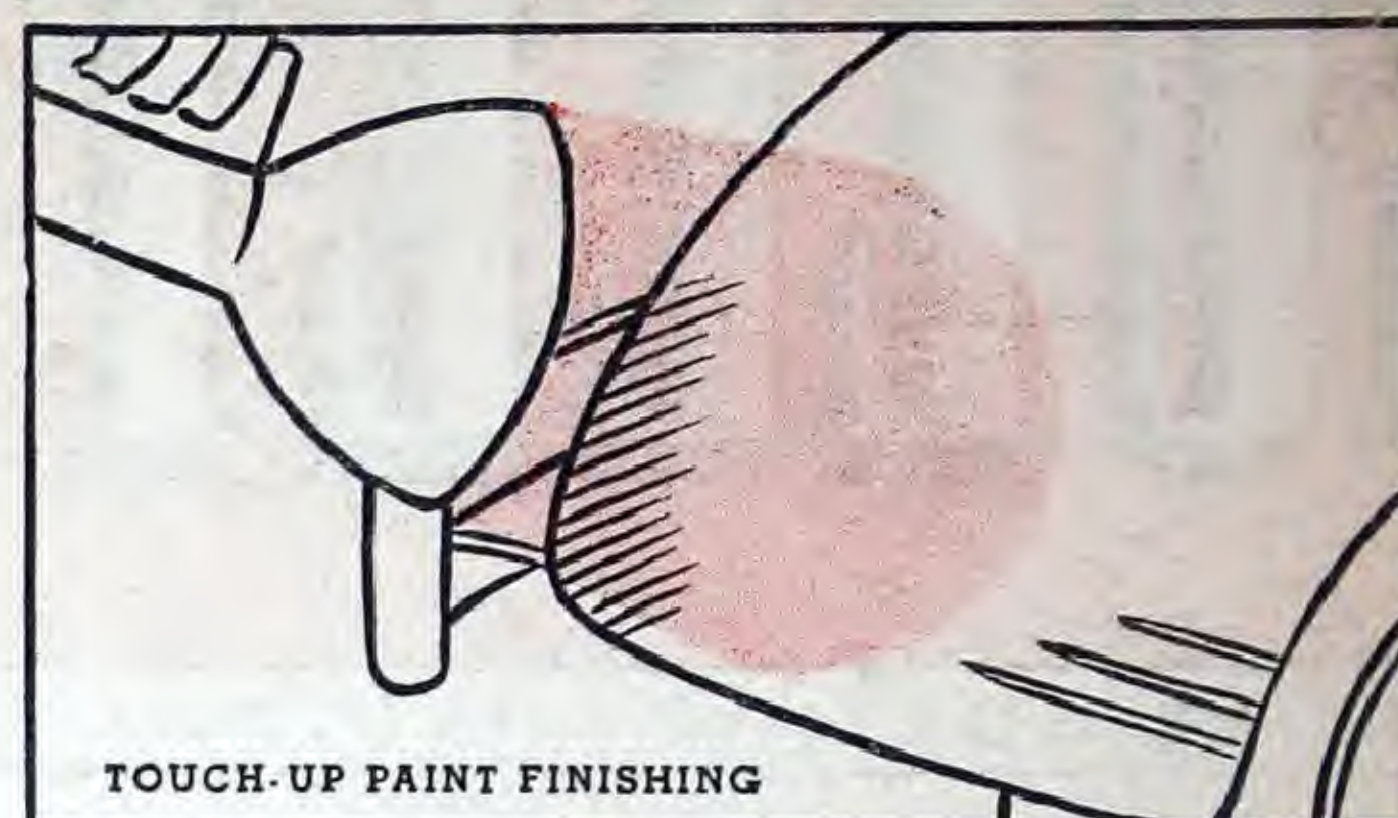
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## APPLICATIONS OF FOSTORIA INFRA-RED UNIT LRJ



Model LRJ Infra-Red hand model should be included as BENCH EQUIPMENT along with the power drill, wrench and screw-driver. It provides quick, easily controlled heat at a variety of intensities in accordance with particular requirements.

This model operates on AC or DC current and is equipped with reflector, cord, plug and "off-and-on" switch.



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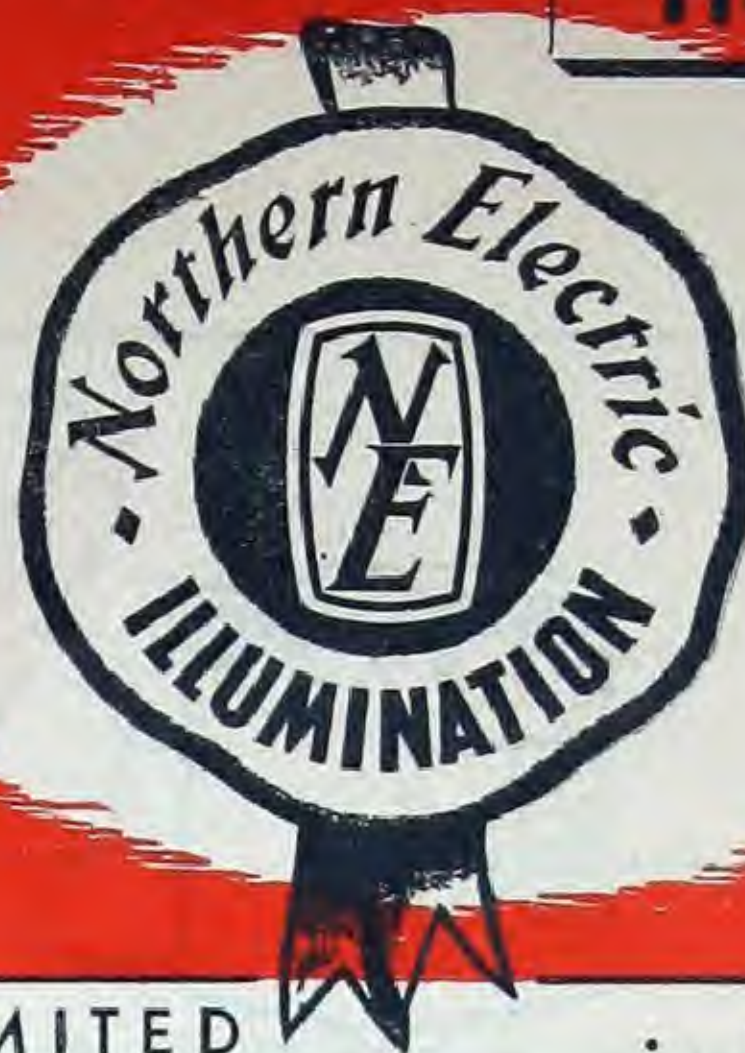
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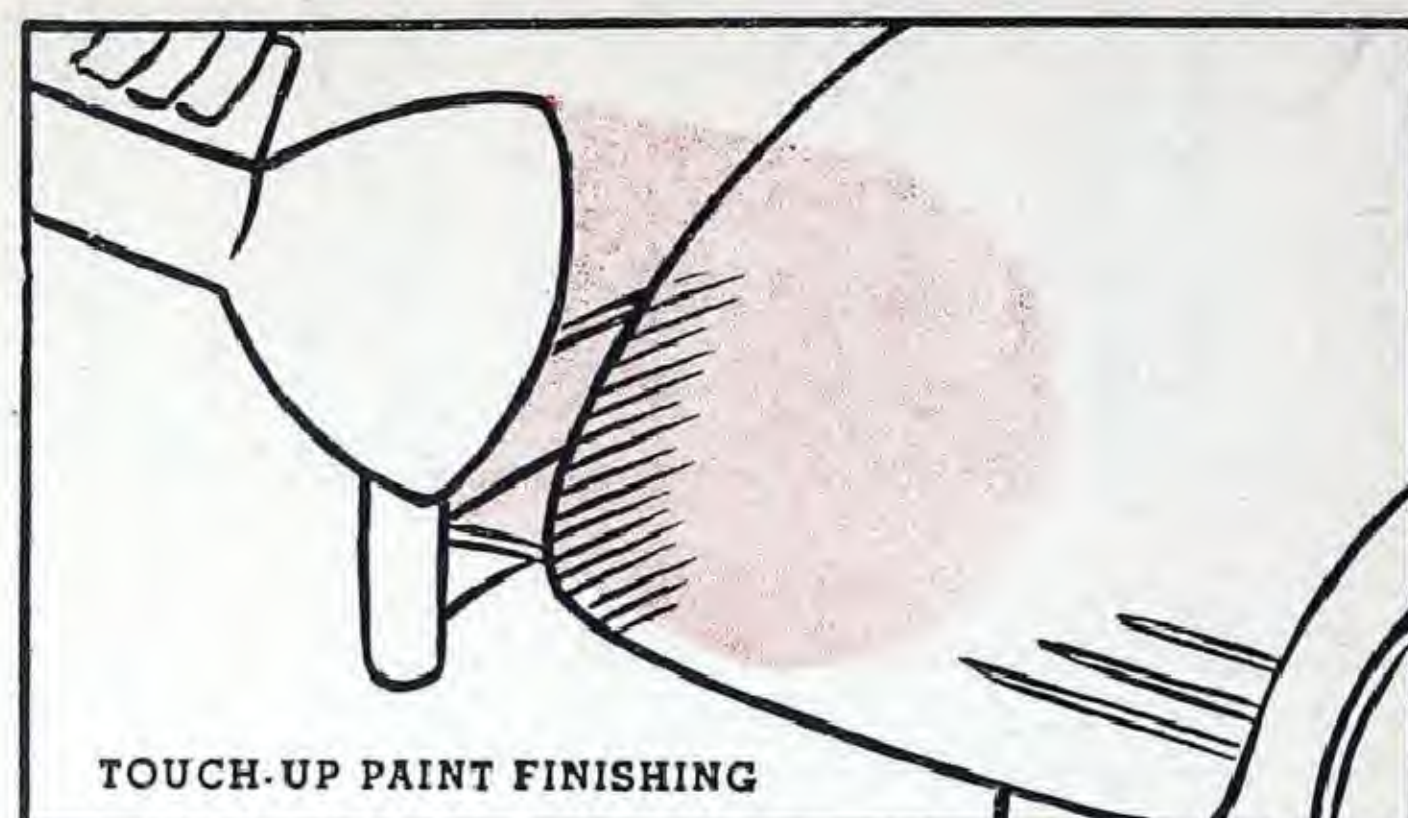
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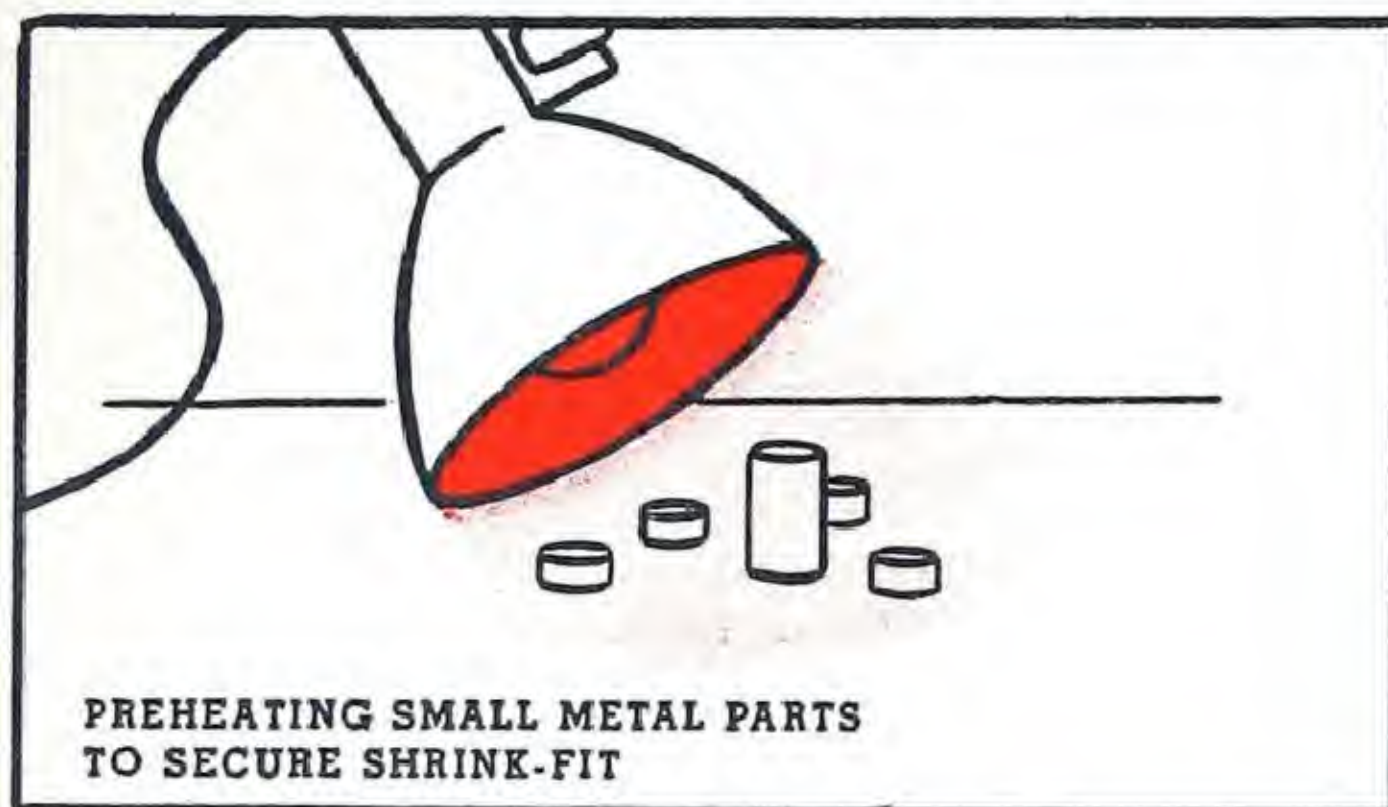
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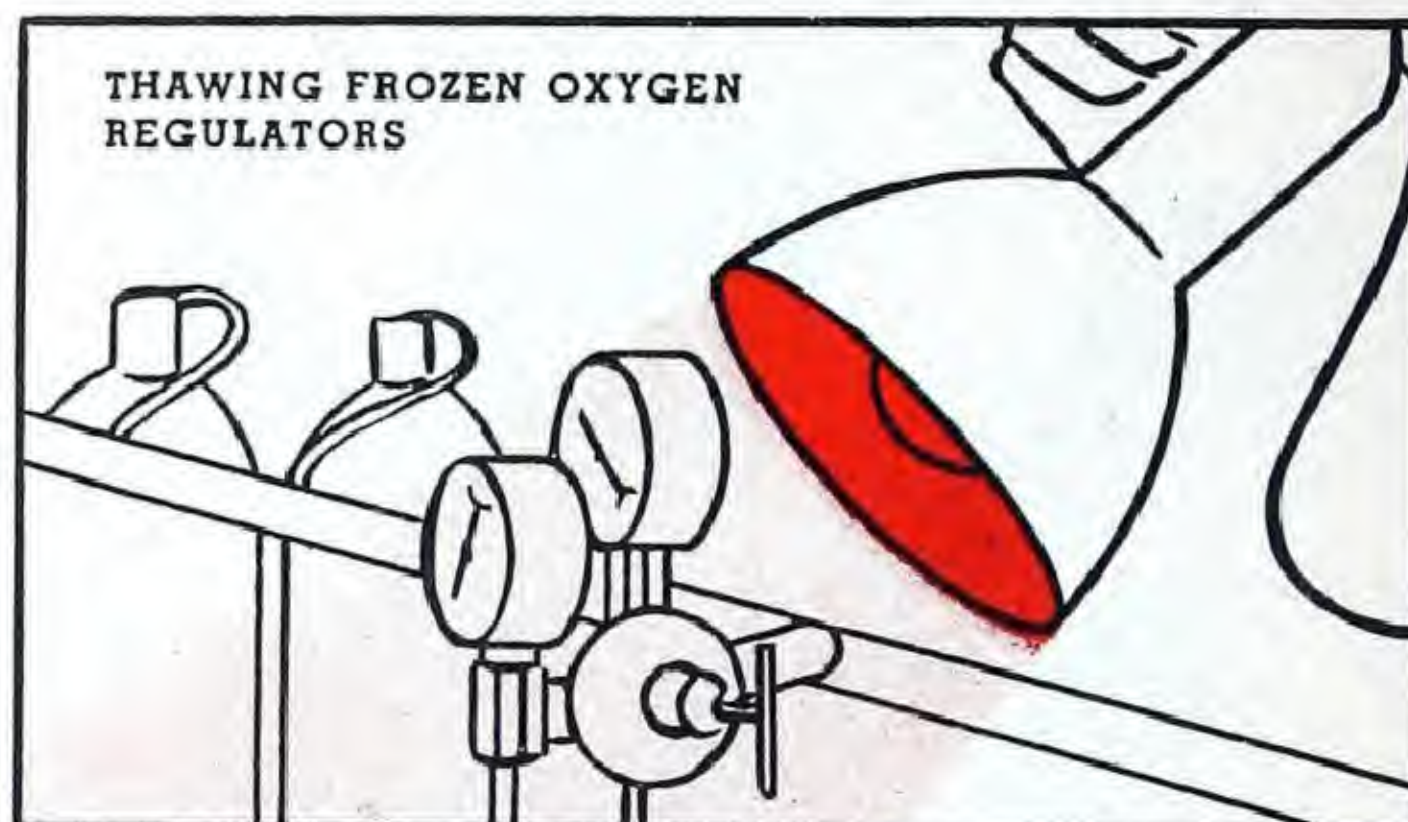
MELTING OR FLOWING GREASE, PITCH, OILS, FATS, SYRUPS, ETC.



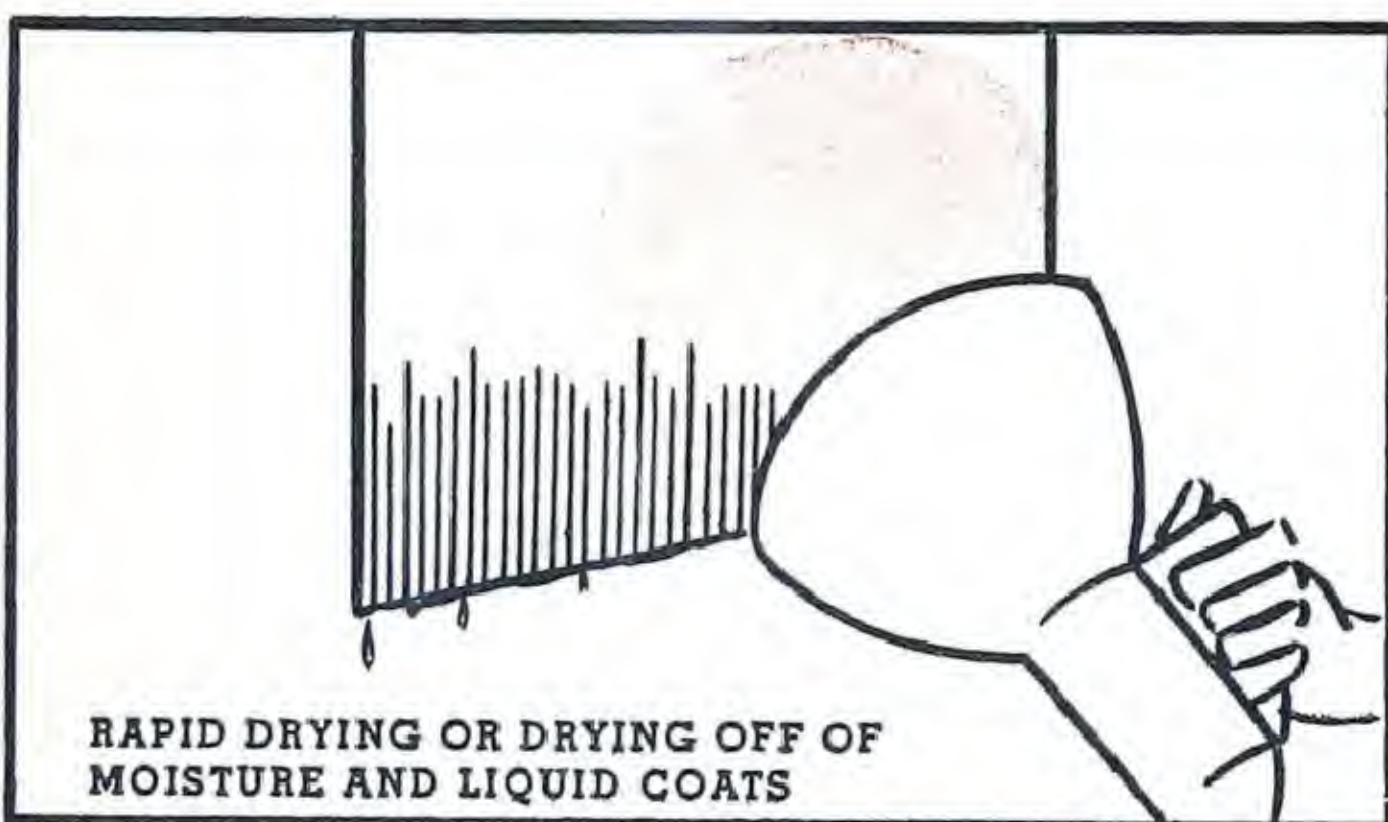
TOUCH-UP PAINT FINISHING



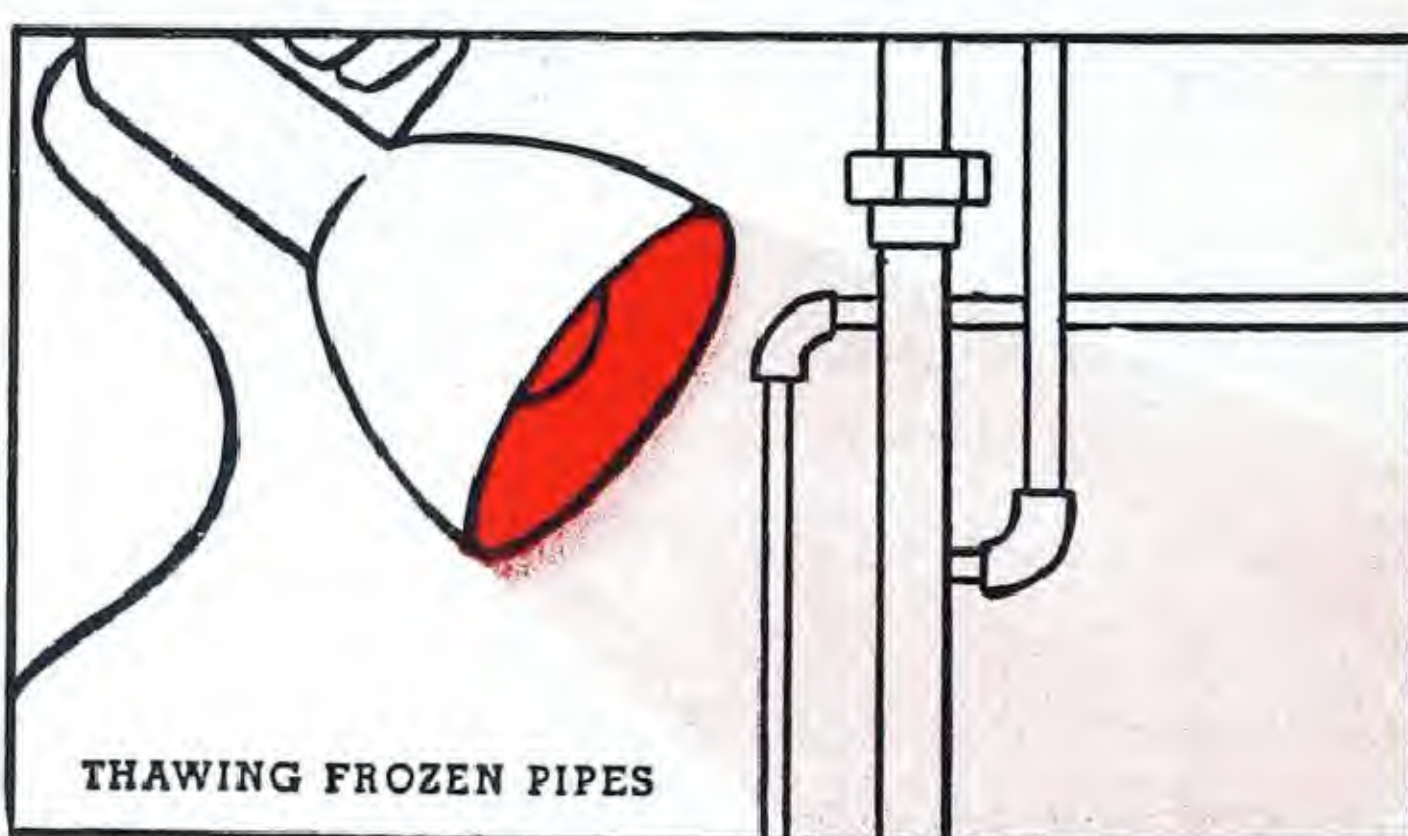
PREHEATING SMALL METAL PARTS TO SECURE SHRINK-FIT



THAWING FROZEN OXYGEN REGULATORS



RAPID DRYING OR DRYING OFF OF MOISTURE AND LIQUID COATS



THAWING FROZEN PIPES

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# Nor-Lectric BULLETIN

April 1944

L-0-4



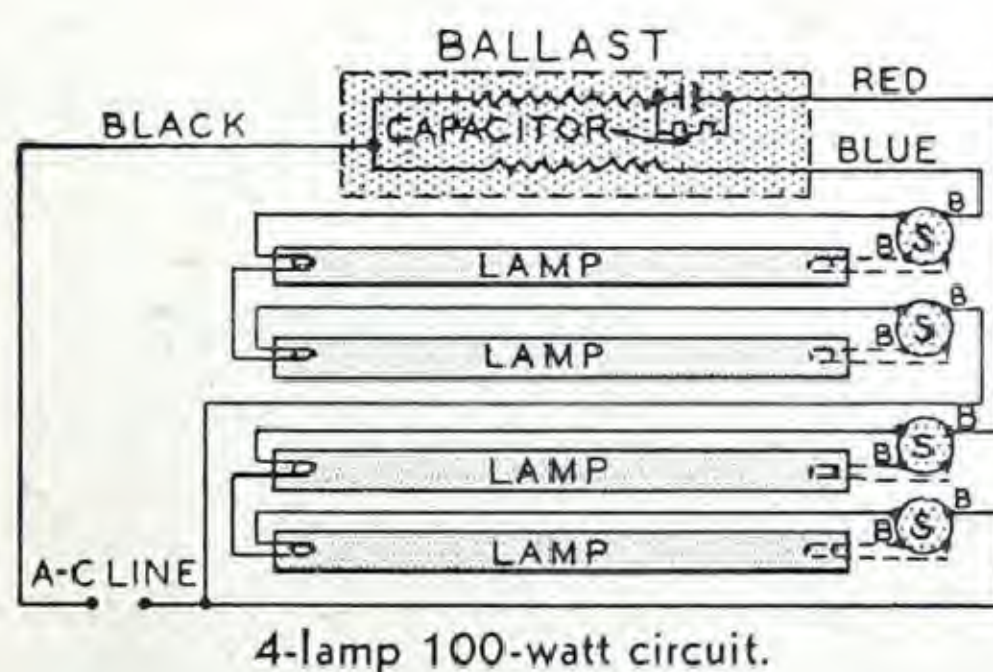
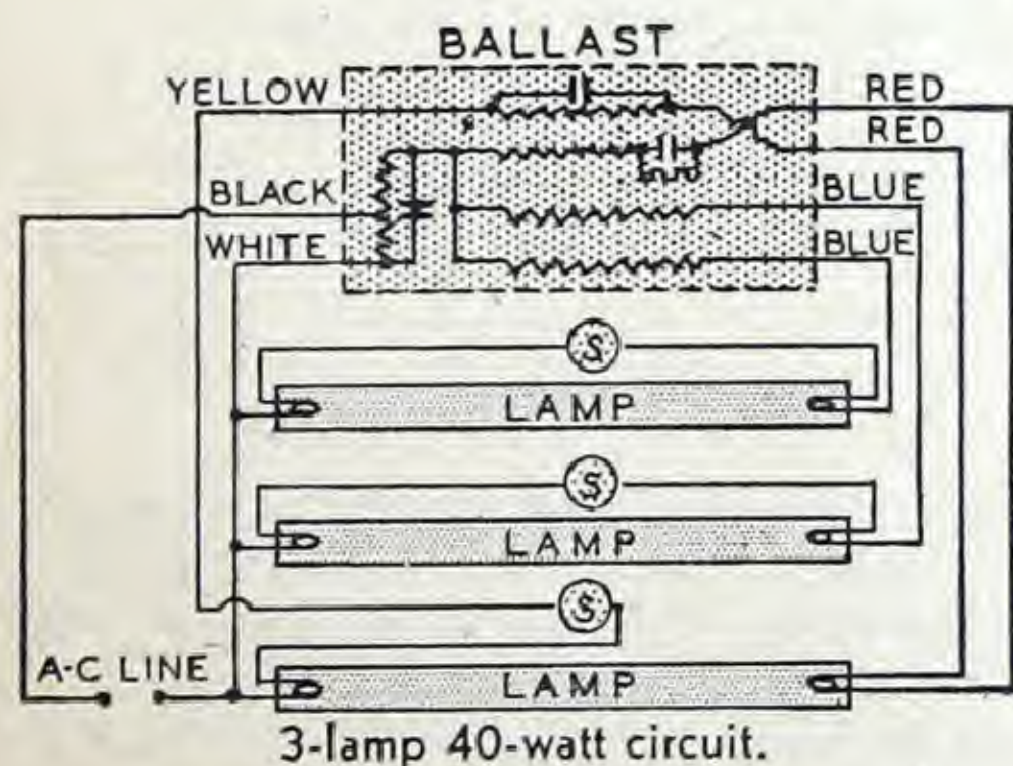
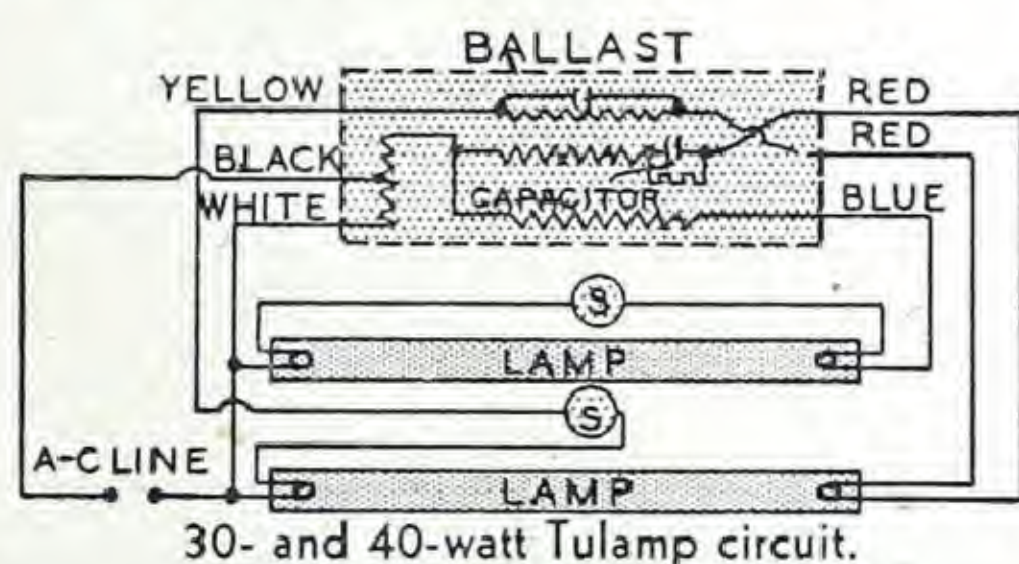
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1944

## FLUORESCENT LAMP SERVICE SUGGESTIONS

Fluorescent Lighting equipment is fundamentally different from Incandescent Lighting fixtures in that every Fluorescent unit contains in addition to the lamps certain apparatus required to start the lamp and maintain a steady flow of current.

The purpose of this bulletin is to give information that will enable users of Fluorescent Lighting to get the utmost usefulness from their equipment.



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## NORMAL END OF LIFE

1. Lamp won't operate; or flashes momentarily and goes out; or blinks on and off, sometimes with shimmering effect; ends probably blackened.

1. Normal failure. Active material on electrodes exhausted.

1. Replace lamp.

## END BLACKENING

1. Dense blackening at one end or both, extending 2" — 3" from base.
2. Blackening within 1" of ends.
3. Blackening early in life. Indicates active material from electrodes being sputtered off too rapidly.

1. Normal end of life.
2. Mercury deposit.
3. Starter defective causing on-off blink or prolonged flashing at each start.
  - 3a. Ends of lamp remain lighted; starter failure due to: short circuit condenser in starter or switch contacts welded together.
  - 3b. No starting compensation in leading circuit of two-lamp ballast.
  - 3c. Ballast improperly designed or outside specifications or wrong ballast being used.
  - 3d. Too low or too high voltage.
  - 3e. Loose circuit contact causing on-off blink.

1. Replace lamp.
2. Should evaporate as lamp is operated.
3. Automatic or Manual Reset starters overcome this difficulty.
  - 3a. Replace starter.
  - 3b. Install compensation in series with starter in leading circuit.
  - 3c. Use ETL approved ballasts of correct rating for lamp size.
  - 3d. Check voltage with range on ballast nameplate.
  - 3e. Lampholders should be rigidly mounted; lamps securely seated.

## DARK STREAKS

1. Streaks lengthwise of tube.

1. Globules of mercury on lower (cooler) part.

1. Rotate tube 180° mercury will evaporate by increased warmth.

## RINGS

1. Brownish rings at one or both ends about 2" from base.

1. May occur on some lamps during life.

1. Has no effect on lamp performance.

## DENSE SPOTS

1. Black, about 1/2" wide, extending half-way around tube, centering 1" from base.

1. May occur near end of life on some lamps. If early in life, indicates excessive starting or operating current.

1. Check for ballast off-rating or unusually high circuit voltage.

## ENDS REMAIN LIGHTED

1. Starter failure due to short circuit condenser in starter or switch contacts welded together.
2. In new installations may be wiring or ground fault.

1. Replace starter.
2. Check circuit wiring.

## DECREASED LIGHT OUTPUT

1. Cold drafts hitting tube.
2. Where heat is confined around lamp, light output is lower.
3. Low temperature operation (below 65%, light loss may be 1% or more per degree F).
4. Low circuit voltage.
5. Dust or dirt on lamps, fixtures, walls or ceiling.
6. Light decreases during first 100 hours.

1. Enclose or protect lamp.
2. Better ventilation of fixtures.
3. Enclose.
4. Check voltage and correct if possible.
5. Clean.
6. Light output during first 100 hours is above published rate by 10%. Rating is based on output at end of 100 hours.

## NOISE

1. Humming sound which may be steady or may come and go.

1. Slight transformer hum inherent in ballast equipment; varies in different ballasts. Objectionable amount may be due to improper installation or improper ballast design.
  - 1a. Overheated ballast.

1. Mount ballasts on four small pieces of felt, soft rubber, celotex, etc., to prevent transferring vibrations to supporting members and to reduce hum to a minimum.
  - 1a. See below.

## BLINKING

1. With shimmering effect during "lighted" period.
2. Blinking of new lamp.

1. Normal on
2. Position

- 2a. Start off at
- 2b. Low
- 2c. Low

- 2d. Col
- 2e. Low

- 2f. Load on-

3. With two lamp ballasts: if one lamp starts, one end of the other may blink on and off without starting; eventually, both lamps may start.

3. Ind the may circ lam its

## SLOW START

1. Op to ope

2. Bur cau of volt
3. Air is fluo troc

4. Sta
5. Sta
6. No lea bal

7. Low
8. Rem circ
9. Bur due Gra lam soc On tou pro D.C. sar Gra cau

10. Low
11. Pas

## RADIO

1. Lam thro

2. Lin bac



ACTION		LAMP BEHAVIOUR	POSSIBLE CAUSES	ACTION
D OFF		COLOUR AND BRIGHTNESS DIFFERENCES		
1. Replace lamp.	2. Replace lamp. Investigate further if successive lamps blink or flicker in same lamp holders.	1. Different colour appearance in different locations of same installation.	1. Actual slight differences in lamps may be discernible; perhaps wrong colour lamp used; possibly lamp outside limits of colour standards; apparent colour difference may be only difference in brightness between old and new lamp.	1. Replace lamp if objectionable.
	2a. Automatic or Manual Reset starters overcome this difficulty.		1a. May be due to reflector finish, wall finish, other nearby light, room decorations, etc.	1a. Interchange lamps before assuming colour difference.
	2b. Check ballast.		2. Low circuit voltage.	2. Check voltage and correct if possible.
2c. Can be operated at lower temperature with thermal starters.		2. Lamps operate at unequal brilliancy.		
2d. Enclose or protect lamp.				
2e. Check voltage and correct if possible.				
2f. Lampholders should be rigidly mounted; lamp securely seated.				
3. Rewire starter leads. Interchange lampholders or starter leads at one end of fixture.				
STARTING EFFORT		FLICKER		
1. If open circuit is shown by test or inspection, replace lamp. To determine necessity for replacing lamp, examine electrode by viewing end of bulb against pinhole of light.	2. Proceed as in No. 1.	1. Pronounced, irregular flicker on looking directly at lamp. (Spiraling, swirling, snaking, etc.).	1. New lamp may flicker.	1. Flicker should clear up after lamp is operated or turned on and off a few times.
			1a. Starter not performing properly to pre-heat electrodes.	1a. Replace starter.
			1b. No starting compensation in leading circuit of two-lamp ballast.	1b. Install compensator in series with starter in leading circuit. None required for 85 watt lamps.
3. Test is made by connecting base pins in series with test lamp on 115 volt circuit. Fluorescent glow means intact electrodes and active electrons.			1c. Ballast improperly designed or outside specifications or wrong ballast being used.	1c. Use ETL approved ballasts of correct rating for lamp size.
			1d. High voltage starting.	1d. Check voltage.
			2. May suddenly develop in any lamp in normal service.	2. Should clear up if turned off for a few seconds.
2. Flicker suddenly occurring.		2. Flicker suddenly occurring.	3. Possibly lamp at fault.	3. Replace lamp. Investigate further if successive lamps blink or flicker in same lampholder.
3. Persistent tendency to flicker.		3. Persistent tendency to flicker.		
		DARK SECTION OF TUBE		
1. $\frac{1}{3}$ to $\frac{1}{2}$ of tube gives no light.	2. If operated on AC.	1. D.C. operation without reversing switches.	1. Install reversing switches.	
		2. Possibly lamp at fault.	2. Replace lamp.	
		SHORT LIFE		
1. Mortality losses.		1. Lamps of shorter life are balanced out by those of longer life to give rated average life.	1. Replace ballast or capacitor.	
		2. Starter defective causing on-off blink or prolonged flashing at each start.	2. Refer to fixture manufacturer.	
		3. Ends of lamp remain lighted due starter failure.	3. Prolonged blinking tends to heat ballast and heating is aggravated under high ambient temperature inside fixture housing. See "Blinking On and Off" under behaviour.	
2. Automatic or Manual Reset starters overcome this difficulty.		4. No starting compensator in leading circuit of two-lamp ballast.	4. Check voltage and correct if possible.	
		5. Ballast improperly designed on wrong ballast being used.	5. Correct wiring.	
		6. Improper ballast equipment on D.C.		
3. Replace starter.		7. Too low or too high voltage.		
		8. Loose circuit contact (likely at lampholder) causing on-off blink.		
		9. Too many lamp starts.		
4. Install compensator in series with starter in leading circuit.				
5. Use ETL approved ballasts of correct rating for lamp size.				
6. Check ballast equipment.				
7. Check voltage with range on ballast nameplate.				
8. Lampholders should be rigidly mounted. Lamp securely seated.				
9. Average life dependent on number of starts and hours of operation.				
		OVERHEATED BALLAST		
1. Short in ballast or capacitor.	2. High ambient temperature inside fixture housing.	1. Short in ballast or capacitor.	1. Replace ballast or capacitor.	
	3. Blinking on and off.	2. Refer to fixture manufacturer.	2. Refer to fixture manufacturer.	
		3. Prolonged blinking tends to heat ballast and heating is aggravated under high ambient temperature inside fixture housing. See "Blinking On and Off" under behaviour.	3. Prolonged blinking tends to heat ballast and heating is aggravated under high ambient temperature inside fixture housing. See "Blinking On and Off" under behaviour.	
4. High circuit voltage.	5. Short in wiring.	4. Check voltage and correct if possible.	4. Check voltage and correct if possible.	
		5. Correct wiring.	5. Correct wiring.	
NCE				
1. Locate aerial and radio at least 10 ft. from lamp; or shield aerial lead-in wire; provide good ground and keep aerial out of lamp and line radiation range.	2. Apply line filter at lamp or fixture; sometimes possible to apply filters at power outlet or panel box.			



## WHAT TESTS ARE IMPORTANT:

The only tests on fluorescent equipment that will be of interest are those which will quickly tell what parts of a fluorescent unit are inoperative, and do it in the shortest possible time.

There are four main elements in every fluorescent circuit:

1. The lamp.
2. The starter.
3. The ballast.
4. The source of electrical supply.

If we can eliminate quickly three of the most likely variables our problem is readily solved.

From the outline of possible troubles covered in the previous parts of this article the probable causes are indicated. As you will have noted, the centres of trouble are (1) starter, (2) lamp, (3) voltage, (4) ballast and wiring.

## TEST EQUIPMENT:

The equipment needed for getting a fluorescent lamp system back in operation or checking a short lamp life complaint are:

1. A high resistance voltmeter to cover a range of from 0 to 300 volts in two ranges.
2. A spare lamp of the right size for the system being tested.
3. A spare starter of the right size for the system being tested.

These two pieces of additional equipment will also be found useful but are not absolutely essential.

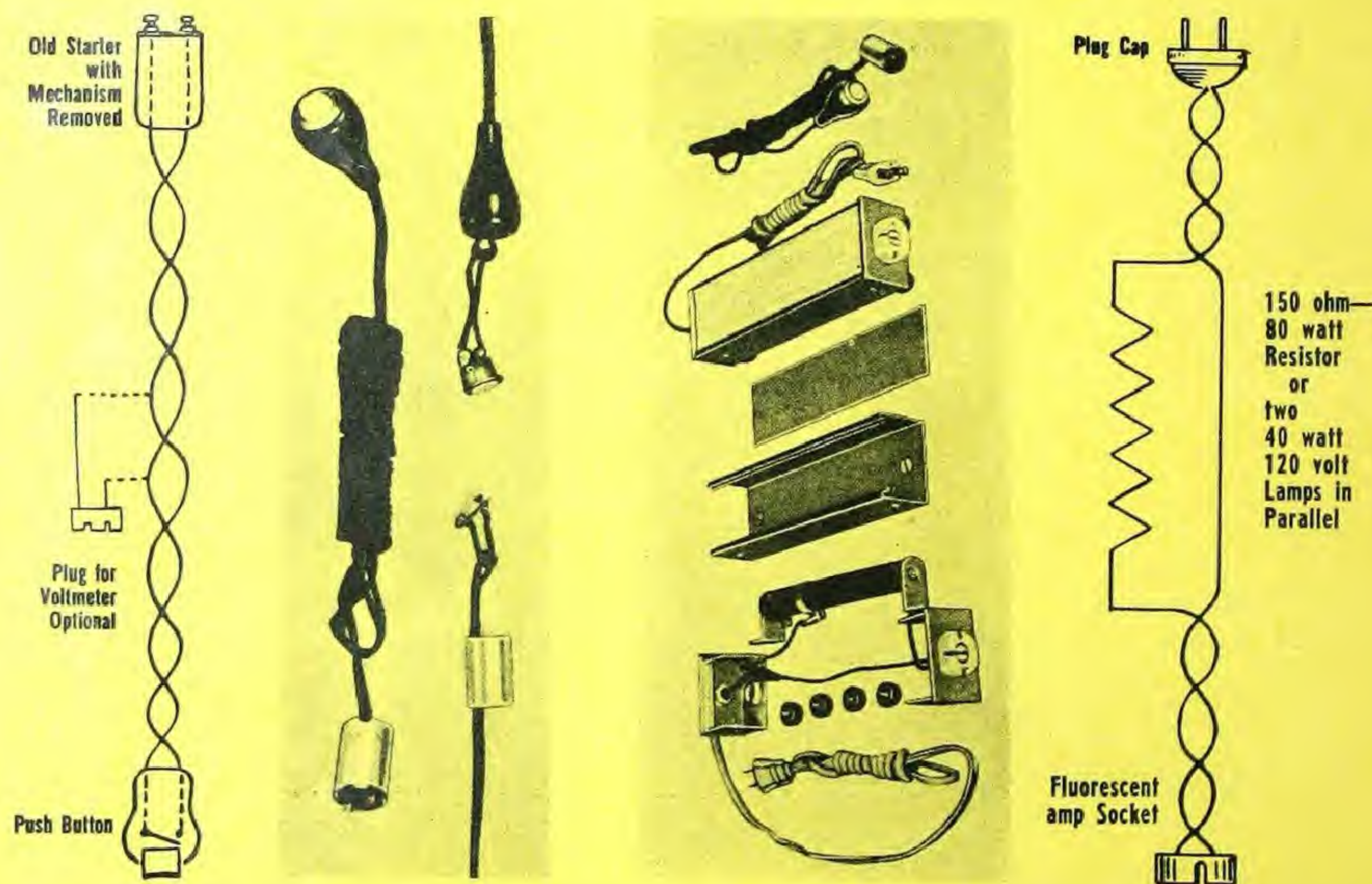
1. A cathode tester for checking cathode continuity and operating condition.
2. A dummy starter for observing the starting cycle and manually starting lamps or with voltmeter attachment for checking starting and operating voltages of lamps.

With the cathode tester it is possible to check lamps out of fixtures for:

1. Open or broken cathodes—the cathode will not light.
2. A normal cathode—bright fluorescent glow.
3. A deactivated cathode—yellow glow.
4. Lamp leaking air—dull red glow (filament usually burns out under test).

The dummy starter can be used to check lamps in fixtures for operating conditions as follows:

1. To observe the colour of the cathode glow.
2. To manually start a fluorescent lamp.
3. With voltmeter attachment to check available starting voltage and lamp operating voltage.



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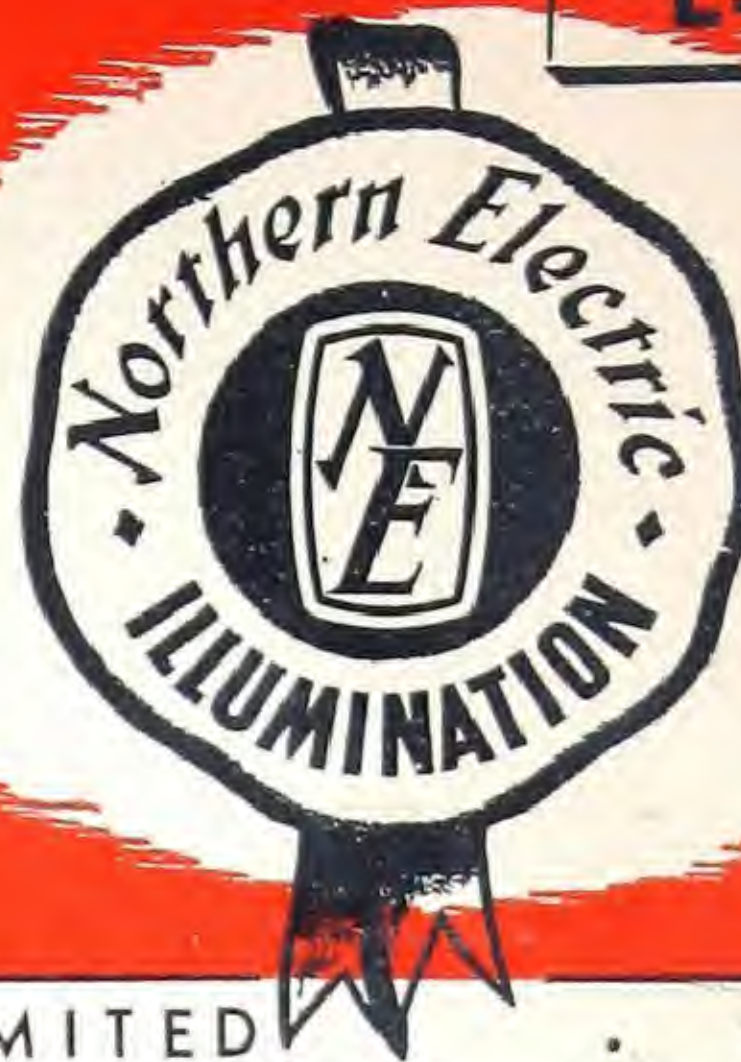
HALIFAX MONCTON QUEBEC CHICOUTIMI THREE RIVERS SHERBROOKE MONTREAL OTTAWA VAL D'OR  
KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
FORT WILLIAM WINNIPEG REGINA LETHBRIDGE CALGARY EDMONTON VERNON VANCOUVER VICTORIA



August 1944

L-1-2

# *Nor-Lectric* BULLETIN



PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED . 194

EDISON

# LAMP

MAZDA

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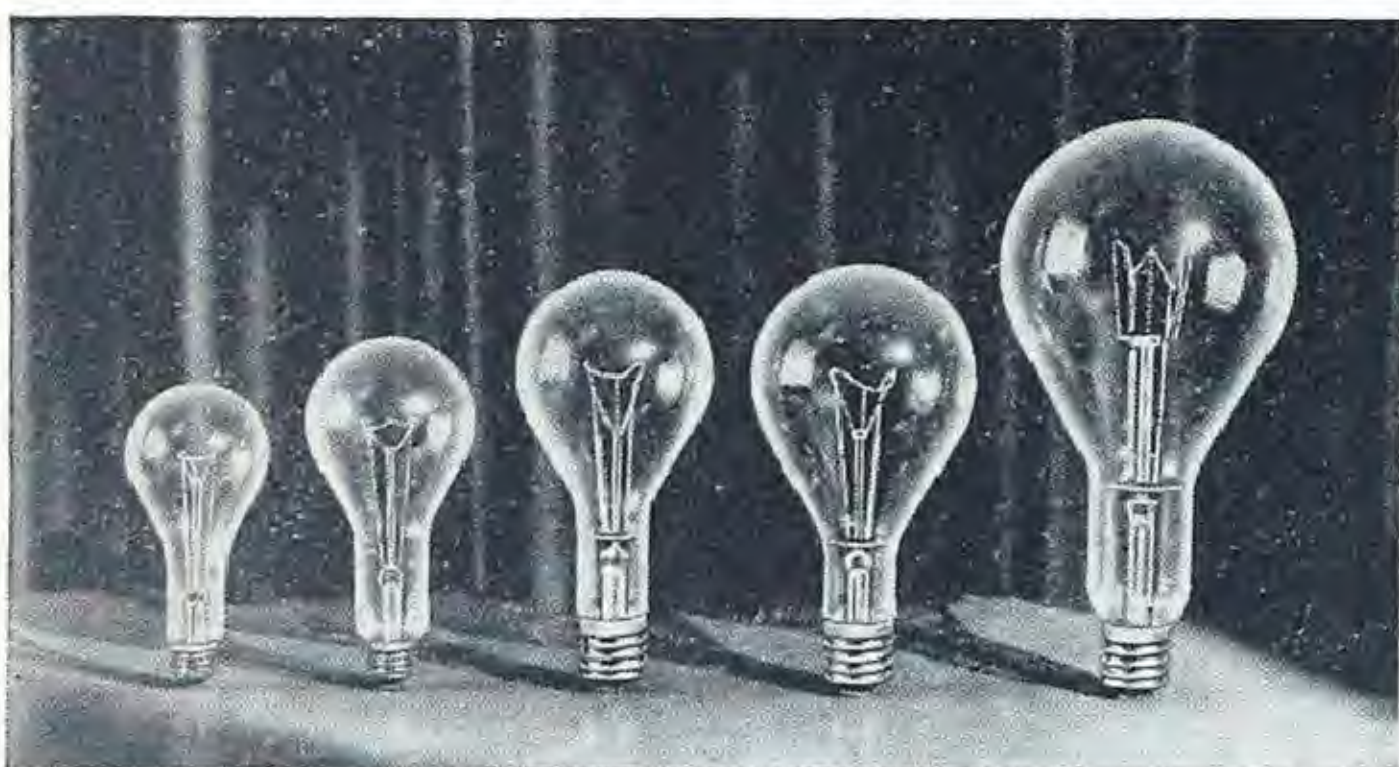
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### INSIDE FROSTED—GENERAL SERVICE

Inside frosted lamps are suitable for about 90% of all home uses and for many commercial applications. Because they diffuse the light without loss of efficiency, these lamps are preferable for general lighting. They should always be shielded from direct observation by the eye with suitable shades or glassware. Inside frosted lamps are available in the following sizes, 15, 25, 40, 60, 100, 150, 200, 300, 500, 750, 1000 and 1500 watts. The 75 and 250 watt sizes have been temporarily discontinued.



### CLEAR LAMPS—GENERAL SERVICE

Clear lamps are employed in fixtures where a point light source is required, such as in prismatic glassware or in silvered mirrored glass reflectors used for store window lighting, or in certain types of floodlights. They are used where accurate light control is essential.

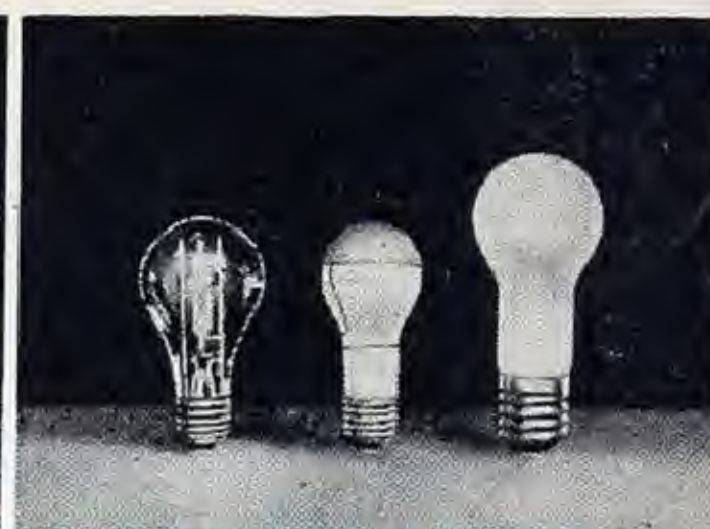
Many people are under the mistaken impression that clear lamps give more light than inside frosted. This is erroneous. Clear lamps are available in (left to right) 100, 150, 200 watt medium base and in 300, 500, 750, 1000 watt mogul base. The 250 watt medium base lamp is temporarily discontinued.

White bowl lamps, formerly used in many industrial fixtures, are temporarily discontinued under authority of the W.P.T.B. Administrator's order. Bowl reflector lamps are effective substitutes for these lamps.



### MISCELLANEOUS LAMPS

Most of the lamps illustrated above are obtainable. They include from left to right the 6 watt candelabra base lamp for pilot lights, the 7 watt C7 lamp for night lights, the 10 watt intermediate base for general indicator and sign use. They can be supplied in clear I.F. and in inside white, blue, green and red colours. The 10 watt S14 medium base sign lamp is available in clear, I.F., daylight clear and in inside blue, green and red color. The 25 watt A19 coloured lamp is only available in inside, blue, green and red colours. The 40 watt A21 coloured lamps and the 25 watt A19 clear sign lamp are temporarily discontinued.



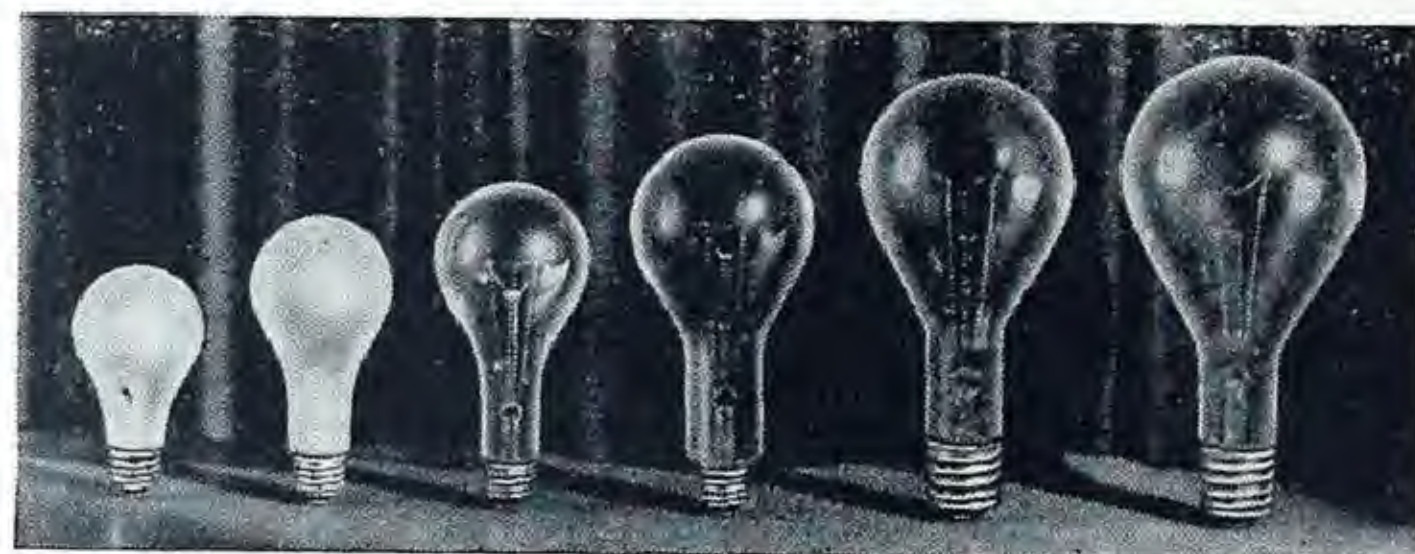
### ROUGH SERVICE AND MILL TYPE LAMPS

Rough service lamps (at left) are used where the lamp will be subject to bumps and other shocks, as in extension cord service. They are available in 50 and 100 watt sizes.

Shown next is the clear mill type lamp designed for use with high speed machinery and other locations where vibrations would cause general service lamps to fail. These lamps are not recommended for general lighting since the number of filament supports required to give them special vibration resistant qualities lowers their efficiency. Clear mill type lamps are available in 50 watt size only. The 25 watt size is temporarily discontinued.

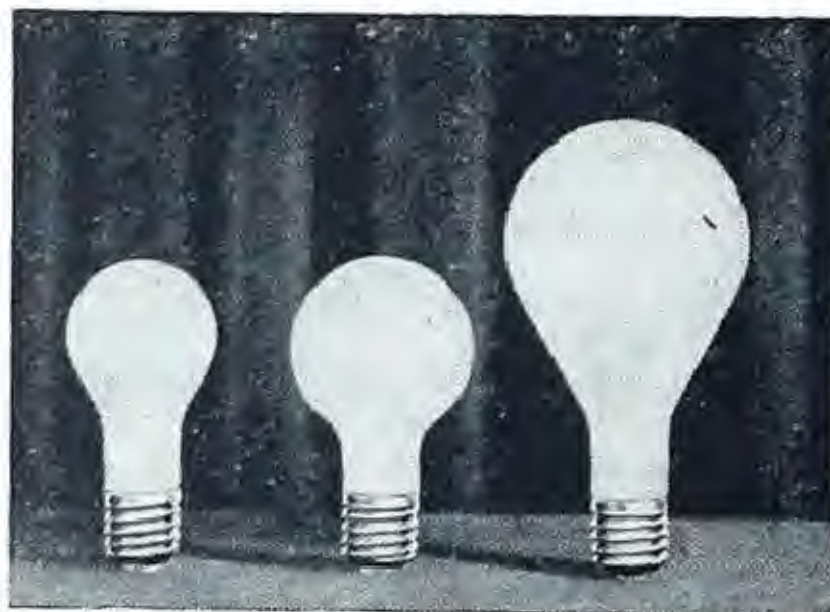
### SUNLAMPS

The S type sunlamps emit ultra-violet rays similar to those of the sun and produce tanning. While these lamps have proved very beneficial in toning up the body as would tanning in the sun, they are not a cure-all or a substitution for cod liver oil and vitamins when ordered by a doctor.



### DAYLIGHT LAMPS

Daylight lamps are ideal where a degree of color correction is required. Daylight lamps do not give a true daylight color, they only remove a percentage of the red light associated with incandescent lamps. The only way true (north sky) daylight can be obtained is with daylight Fluorescent lamps. Daylight lamps are available (left to right) in 60 and 100 watt sizes in inside frosted, daylight and in 150, 200, 300 and 500 watt sizes in clear daylight.



### 3-LIGHT LAMPS—BIPOST LAMPS

3-light lamps are employed in floor lamps for home use and the 200/300/500 in fixtures for special commercial applications. The following two sizes are available (left to right) 50/100/150 and 100/200/300 watt. The 200/300/500 watt size (at right) is temporarily discontinued.

Medium Bipost lamps are used in certain small sized, high wattage, indirect commercial fixtures and are available in 500, 750 and 1000 watt sizes.

This bulletin is based on information furnished by the Canadian General Electric Company Limited, manufacturers of Edison Mazda lamps.





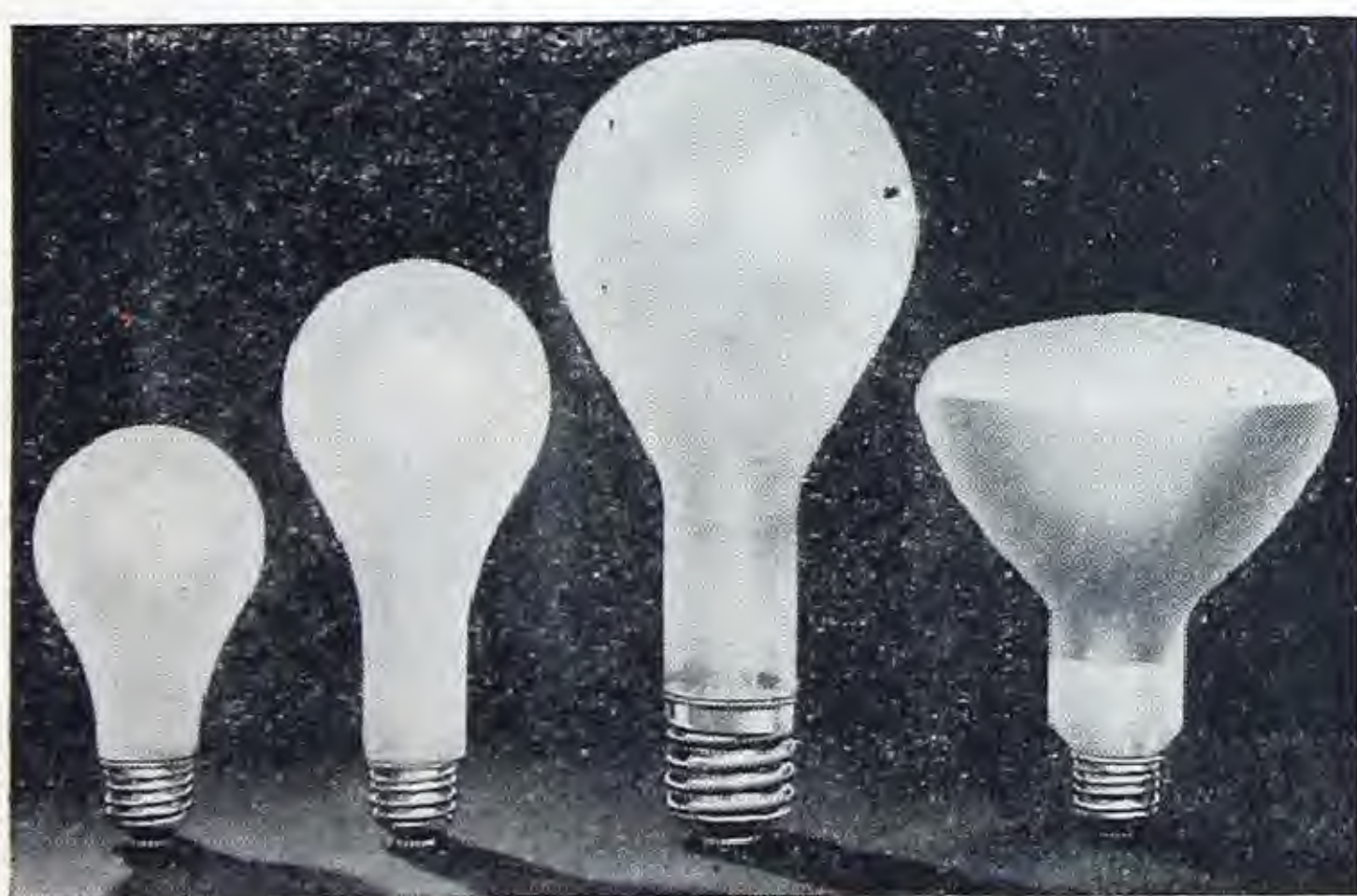
### NECK REFLECTING LAMPS

Neck reflecting lamps are applied where it is impractical to install standard reflectors or where the installation is of such a temporary nature that it would be uneconomical to purchase reflecting equipment. The use of neck reflecting lamps in locations where it is practical to use reflectors is not recommended since the higher cost of the lamp, over standard service types, makes their use rather expensive. These lamps are available in 60, 100, 150, 200, 300, 500, 750 and 1000 watt sizes. The 40 watt size has been temporarily discontinued.



### BOWL REFLECTOR LAMPS

Bowl reflector lamps were originally designed for use with shallow indirect fixtures and in certain industrial units. Today, in addition to these functions, bowl reflector lamps find many applications where an indirect source of light is required. They are available in 60, 100, 150, 200, 300, 500, 750 and 1000 watt sizes with inside frosted necks. The 25, 40 and 75 watt sizes have been temporarily discontinued as have all wattages with clear glass necks.



### PHOTOFLOOD LAMPS

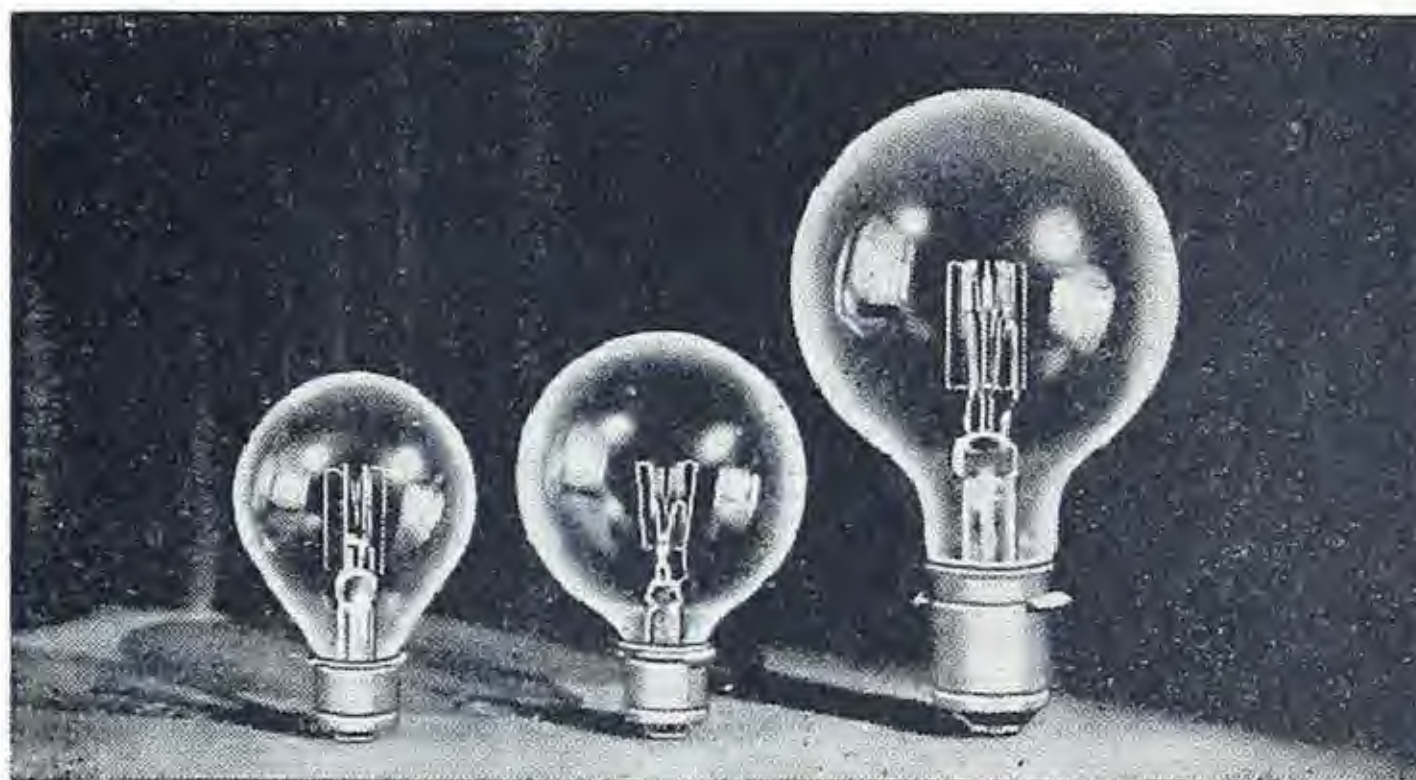
Photoflood lamps are used for taking indoor photographs. Although they have a very short life, varying from two to ten hours, these lamps are very popular with the amateur photographer. They come in four sizes and are known as, from left to right, No. 1, No. 2, No. 4 and No. R2 reflector photoflood, rated at 250, 500, 1000 and 500 watts respectively.

Photoenlarger lamps, similar in size to the photofloods but finished with a heavy inside white coating are used in processing and printing amateur and professional photographs.



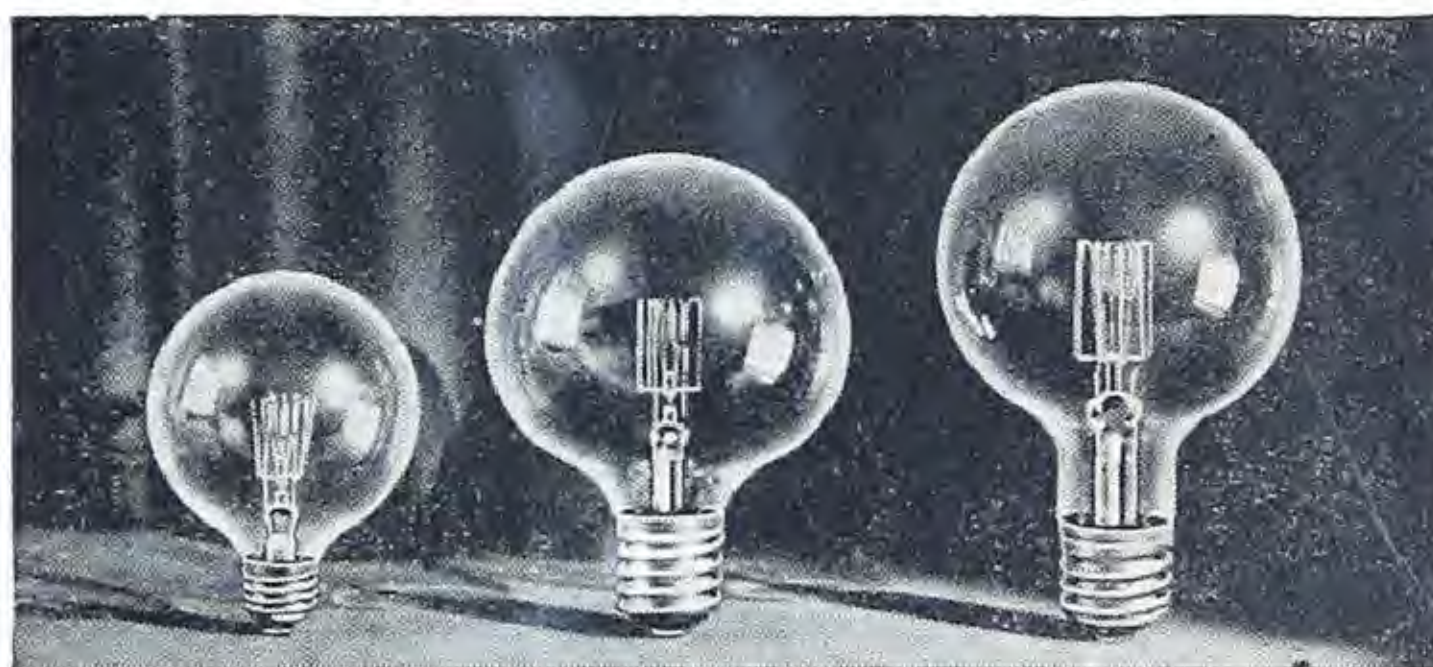
### PROJECTION LAMPS

Projection lamps are employed in motion picture machines, stereopticons and film slide projectors as well as in many instruments. When ordering these lamps, a number of points should be specified. For instance, bulb size, bulb shape (usually tubular), type of base, filament shape, voltage and watts or ampere. A guide to these ordering points will be found at the beginning of the Nor-Letric Bulletin L-1-1.



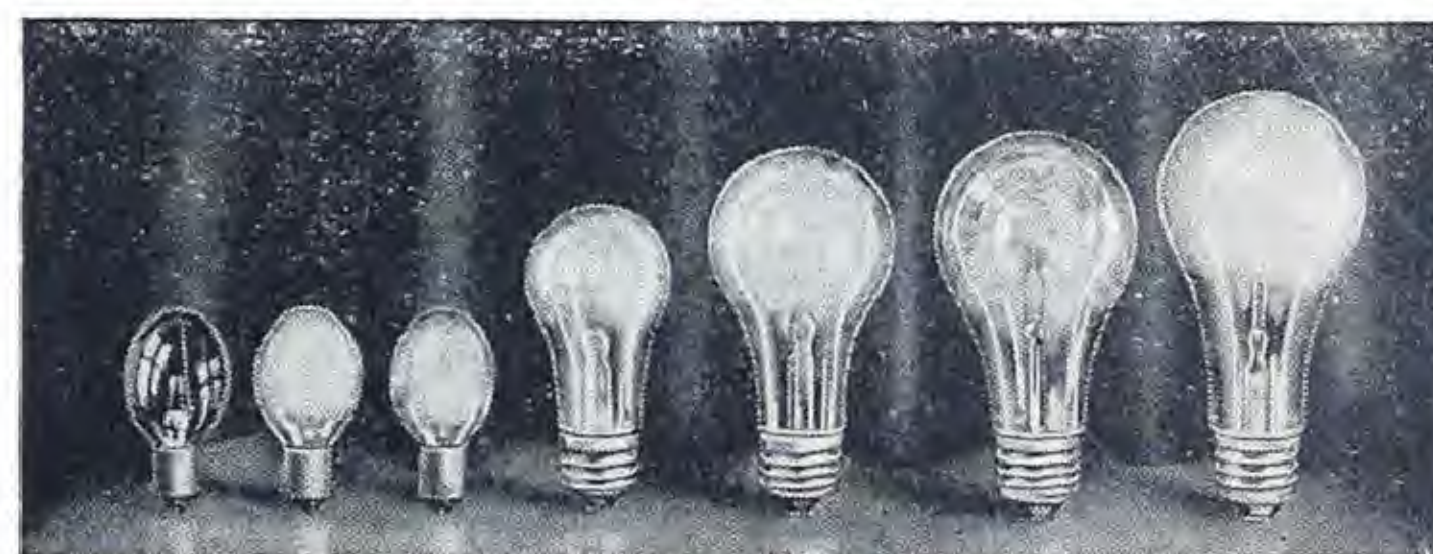
### SPOTLIGHT LAMPS

Spotlight lamps are used in equipment designed for their characteristics and when ordering these lamps information similar to that required for projection lamps is usually necessary.



### FLOODLIGHT LAMPS

Floodlight lamps are used in equipment designed for their characteristics and when ordering these lamps information similar to that required for projection lamps is usually necessary.



### PHOTOFLASH LAMPS

Photoflash lamps are excellent for indoor and outdoor photography where it would be inconvenient to set up regular photographic lighting equipment. They come in a number of sizes as illustrated above. At the present time most of the production facilities for these lamps are engaged in filling the needs of military and newspaper photographers. They will again be available in quantity after the war.





### PROJECTOR AND REFLECTOR SPOTLIGHTS

Projector and reflector spotlights find application where it would not be economical to use standard spotlight and floodlight uses. The R40 type of lamp is the least expensive of the two but has the disadvantage of relatively poor light control and it is also subject to cracking when used out-of-doors. The PAR38 lamps are made of hard cast glass. The lens section is optically designed to give accurate light control and the whole lamp will stand exposure to a wide range of temperature and moisture conditions. These lamps are recommended for all outdoor uses and where accurate light control is an important factor. The R40 lamps (left) are available in 150, 200 and 300 watt sizes and in both spotlight and floodlight distributions. The 150 watt projector spot is shown in center and the 150 projector flood at right.



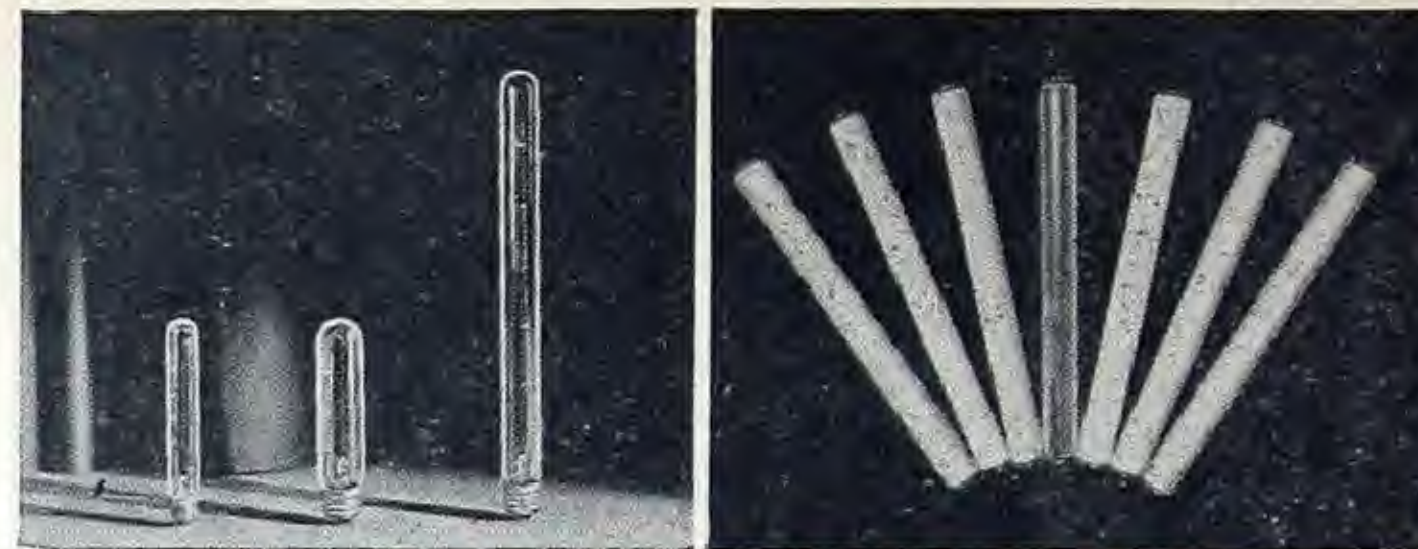
### DRYING AND HEAT LAMPS

Drying lamps are primarily designed for drying paints and varnishes of the synthetic type. However, their use has been extended to a wide variety of heat applications such as expanding piston rings, drying glue, etc. The 250 watt reflector type illustrated is the most popular for making paint repairs to automobiles or furniture in local garages and shops. Drying lamps are also employed to provide heat for brooders and for other heat applications around the farm. Clear drying lamps of 250, 400, 500 and 1000 watt sizes are made for use in suitable reflectors and are the type most generally used in industry. The 250 watt reflector heat lamp is designed for infra-red therapy.



### DECORATIVE LAMPS

All decorative lamps have been classified by the W.P.T.B. as non-essential. These lamps are temporarily discontinued: 15W F10, 15 and 25 watt F15, 25 watt G18½ and the 25 and 40 watt G25 decorative lamps.



### SHOWCASE AND LUMILINE LAMPS

These lamps are tubular in shape and are designed for use in restricted locations such as in showcases. Because of their long thin filament, they will not resist shocks. Left to right, T6½ intermediate base lamp; 24-watt T10 medium base lamp. The 40 watt T8 medium base lamp. The 25 and 50 watt T8 lamps are temporarily discontinued.

### LUMILINE LAMPS

Coloured lumiline lamps have been temporarily discontinued. While lumiline lamps, in clear and white, are shown in our price lists, deliveries are uncertain. Lumiline lamps are made in three sizes—30 and 60 watt 18 inches long and in the 40 watt size 12 inches long.



### FLUORESCENT LAMPS

These lamps are made in 4 watt, 6, 8, 14, 15, 20, 30, 40, 65 and 100 watt sizes, varying in length from 6 inches to 5 feet. At present Fluorescent lamps are available only in white and daylight colours as the soft white, blue, green, pink, red and gold colours have been temporarily discontinued. The 4, 6, 20, 30 and 40 watt sizes are available also in a 360BL (Black Light) colour for fluorescing minerals, inks, etc.



### GERMICIDAL LAMPS

A special tubular lamp which resembles the Fluorescent in size and shape, but which uses a clear quartz glass, has the power to kill fungi and many air-carried germs. This lamp, known as the germicidal lamp, is finding rapid public acceptance and at present is being used in public places such as schools, hospitals, public halls and in many manufacturing plants handling food. In the near future it will probably be found in the home. The common sizes of Germicidal lamps are the 8, 15 and 30 watt sizes.

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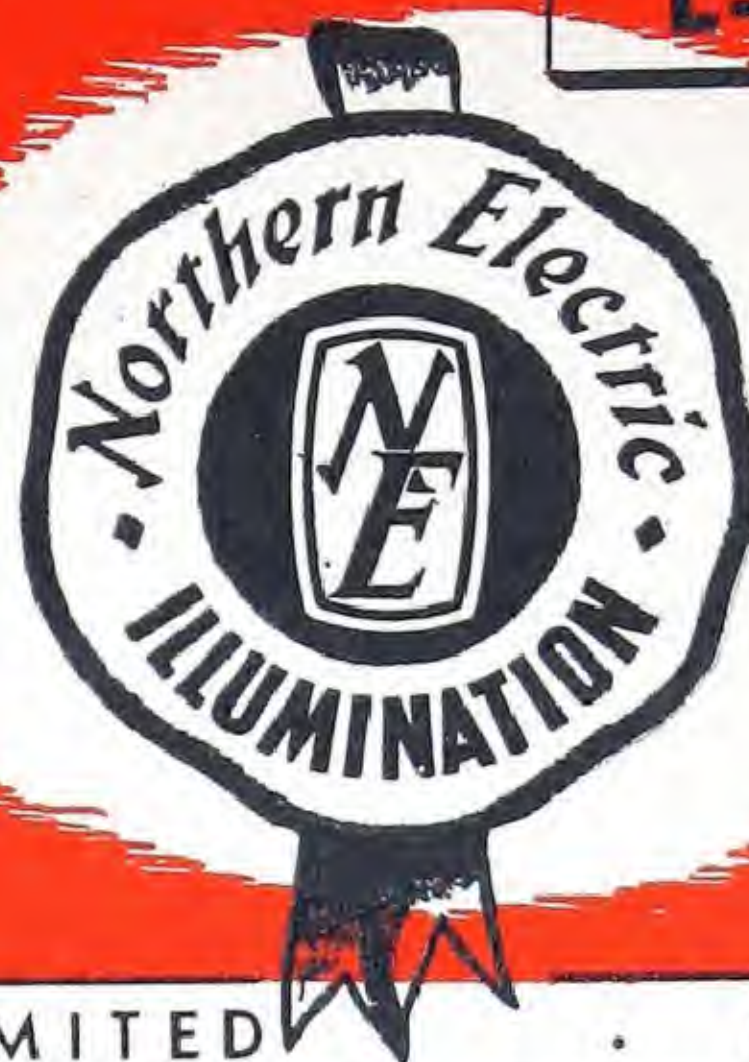


**Nor-Lectric**

August 1944

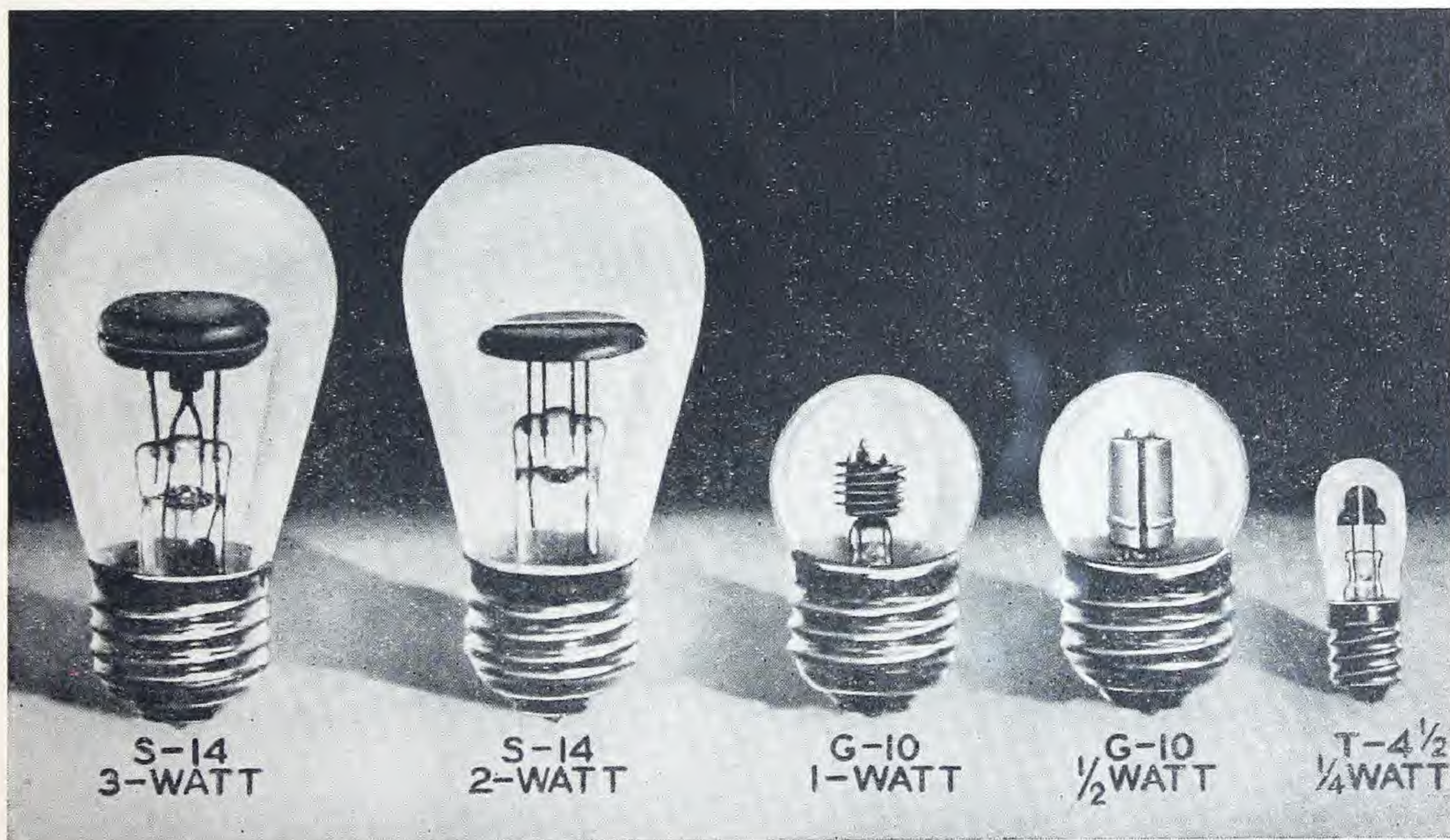
L-1-3

# BULLETIN



ISHED BY NORTHERN ELECTRIC COMPANY LIMITED . 1944

## NEON AND ARGON GLOW LAMPS



Glow Lamps, a modern electrical device, produce light through the agency of electrically excited rare gases. The lamps operate directly from commercial lighting circuits, no accessory devices being required.

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# STANDARD NEON AND ARGON GLOW LAMPS—115-125 VOLTS

ILLUSTRATED ON PREVIOUS PAGE

## UNIT PACKAGE 10: STANDARD PACKAGE 100

Watts	Starting Volts below mini- mum marking on base		Cur- rent Rating Amps. at 120 Volts	Approx. Resistance in Base Ohms*	Bulb	Finish†	Screw Base	Service§	Useful Life Hours at 120 Volts	Electrode Shape	Gas	Overall Length, Inches	List Price
	A.C.	D.C.											
3	60	25	.030	2200	S-14	Clear	Med.†	A.C.—D.C.	3000	Rnd. Plates	Neon	3-9/32	\$0.80
2	60	25	.020	3500	S-14	Clear	Med.†	A.C.—D.C.	3000	Half Round Plates	Neon	3-9/32	.70
2	60	25	.020	3500	S-14	Sprayed Red or Yellow	Med.†	A.C.—D.C.	3000	Half Round Plates	Neon	3-9/32	.78
2½	60	25	.025	2500	S-14	Clear only	Med.†	A.C.—D.C.	3000	Half Round Plates	Argon	3-9/32	.70
½ <sup>+</sup>	20	—	.005	3500	G-10	Clear	Med.†	A.C. only	3000	Cylinder	Neon	1-63/64	.60
1	60	25	.010	4800	G-10	Clear	Med.†	A.C.—D.C.	3000	Cy. & Helix	Neon	1-63/64	.60
¼	60	25	.002	30,000	T-4½	Clear only	Cand.	A.C.—D.C.	3000	Hemisphere	Neon	1½	.60
¼	40	—	.003	20,000	T-4½	Clear only	Cand.	A.C. only	1000	Hemisphere	Argon	1½	.70

\*Supplied in 1 Watt size for 210-240 Volt—A.C. or D.C. Service—Medium Screw Base only. List .60 each.

†Will be supplied in Skirted Candelabra Screw Base 8c additional list.

\*Lamps will be furnished without resistance, only when equipped with Double Contact Bayonet base of corresponding size at 8c additional. S-14 bulb will be equipped with Skirted Double Contact Bayonet Candelabra base at 8c additional.

§On direct current only one (the negative) electrode glows, but gives same C.P. as do both electrodes on A.C.

‡Lamps listed in clear finish will be supplied with sprayed red or yellow finish at 8c additional, except ½ watt sizes.

NOTE:—Normal Light output is obtained at voltage range shown; lamps will operate at reduced light output down to starting voltage shown.

## WHY GLOW LAMPS ARE USED

Glow Lamps are selected for innumerable uses because of:

1. Low current consumption
2. Insignificant heat
3. Reliability
4. Long life
5. Wide voltage range
6. Ruggedness

The low current consumption is indicated by the current range, which is from only .002 ampere for the smallest to .030 ampere for the largest lamp now manufactured.

On direct current only one (the negative) electrode glows, but gives the same light output as do both electrodes on alternating current.

Having no filament, Glow Lamps produce a negligible amount of heat and withstand shock and vibration to an unusual degree. They may be subjected to voltage variations without greatly affecting either life or light output. They have an average useful life of 3,000 hours.

These lamps are extremely dependable. Unlike other lamps, they do not suddenly fail at the end of some definite period but slowly decrease in light output; gradual disintegration causing the walls of the bulb to slowly darken and this is accompanied by an increasing cathode drop so that, after 3,000 hours' use, the light output has dropped to 70% of its initial value. This process continues until the lamp is no longer useful as a light giving device. Unless the lamps are broken, or subjected to a mechanical shock sufficiently violent to short-circuit the electrodes, they will not suddenly fail. This reliability recommends them for many unusual uses.



## WHERE GLOW LAMPS ARE USED

The unique characteristics of the glow lamp lend themselves to many applications and uses which would be quite impossible with devices not possessing these characteristics. Its ability to produce light at low energy levels suggests its use as a signal or pilot in circuits where low current drain is desirable as in radio circuits, "B" battery-operated devices and high-resistance circuits. It may be used in capacitively or inductively-coupled circuits where little current may be drawn.

### AS A TEST LAMP

- (1) Circuit alive—circuit continuity.
- (2) By brilliancy, whether 110 or 220 volts.
- (3) By flicker, if 25 cycle.
- (4) Polarity (only negative glows on direct current).
- (5) Grounded neutral wire. Holding one lead in hand and touching separately each of 3 legs of a 3-wire system with the other lead, the two live lines will cause a glow. Lamp will not light on grounded neutral.

High sensitivity suits the lamp to many high resistance tests, such as checking leakage in capacitors (Fig. 1); leakage between tube elements; leaks in insulating material (Fig. 2); conductivity of liquids (Fig. 3) and many similar uses. If the lamp should prove to be too sensitive, showing up conditions which may not be particularly serious, the lamp sensitivity may be regulated by shunting a high resistance across it.

### AS A SIGNAL OR PILOT LAMP

In many cases, the lamp may be permanently connected in a production line or on a machine to indicate the occurrence of certain conditions. It might be used as an indicator of any of the conditions mentioned under the heading "As a Test Lamp."

As a low-current, dependable, long-life pilot lamp, the glow lamp is outstanding and has already been used extensively on all kinds of electrically-heated or operated devices, as well as for exit lights, fire station markers and location signals for valves, switches or other emergency control units.

Some further pilot lamp applications are shown in the following sketches.

Many other adaptations may be made of the critical breakdown voltage of the glow lamp by connecting it across resistors, chokes or current transformers so chosen that the normal drop across the lamp is below breakdown. Then, any condition which causes the voltage to reach the breakdown value will be indicated by a glow in the lamp.

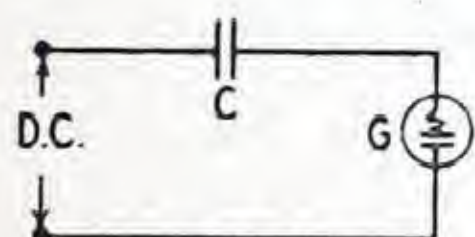


FIG. 1

A glow lamp as an indicator of short circuits or high resistance leaks in capacitors.

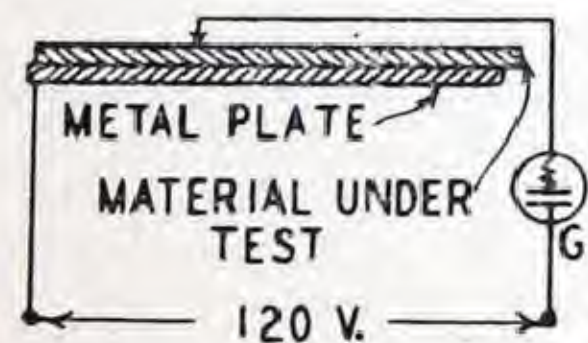


FIG. 2

A glow lamp used to test insulating paper, cloth or other materials.

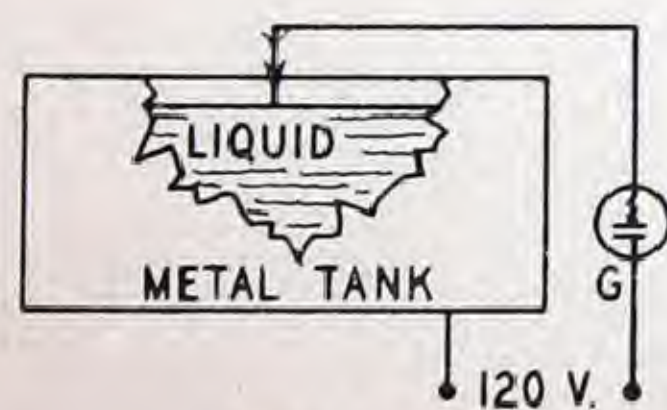


FIG. 3

A glow lamp used to check conductivity of liquids.

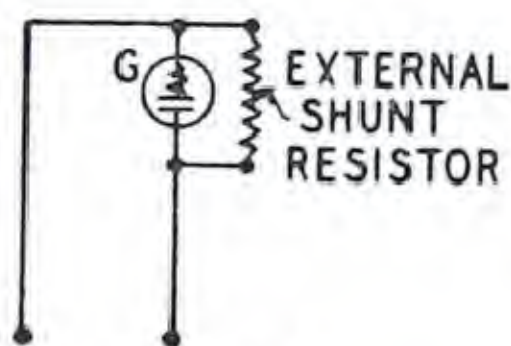


FIG. 4

Shunt resistors may be used to regulate the sensitivity of glow lamps.

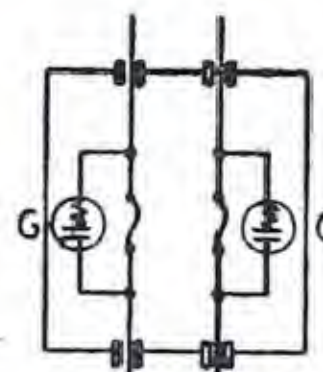


FIG. 5

When a fuse blows, the corresponding glow lamp lights.

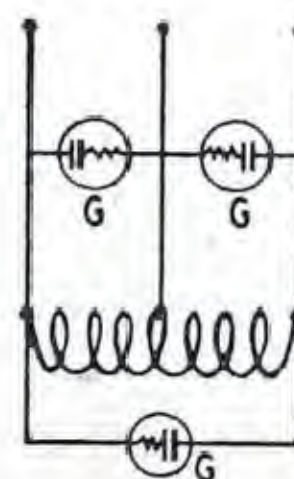
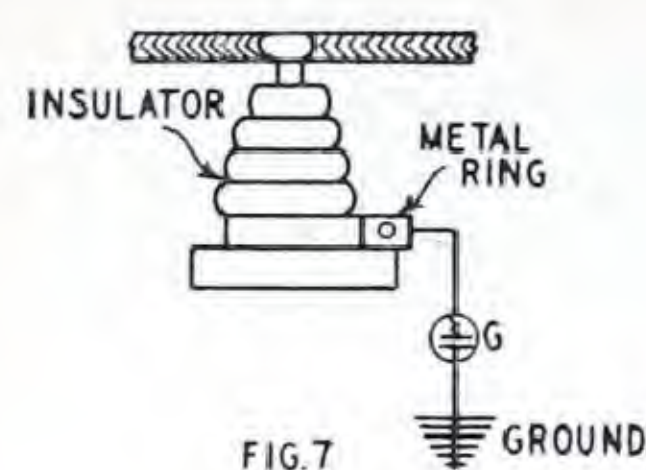


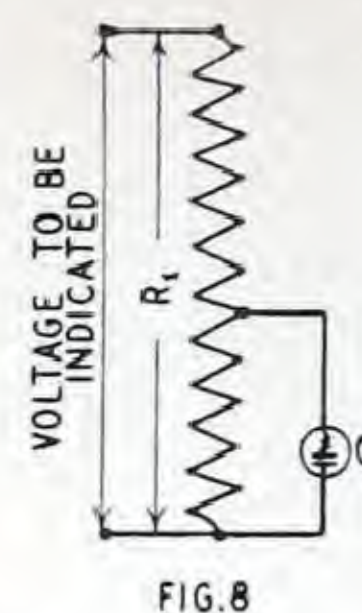
FIG. 6

Serious unbalance is indicated by change in brightness or extinguishing of glow lamp.

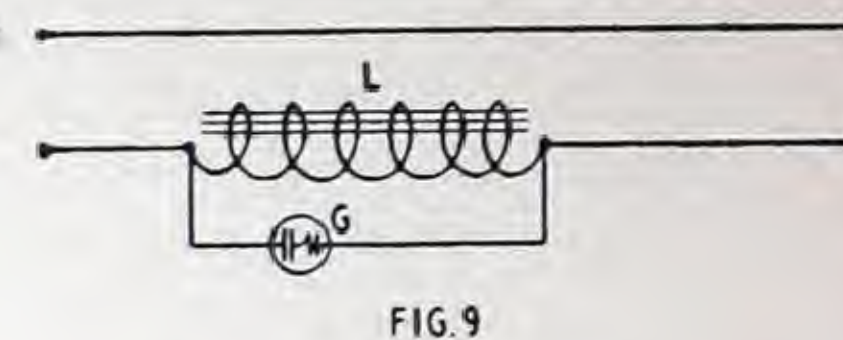




Capacitively connected to high-tension line, the glow lamp indicates when line is alive.



As a visual voltmeter when desired voltage develops across  $R_1$ , the voltage across the lamp rises to the breakdown value, causing it to light.



Connection to indicate voltage breakdown value.

## OTHER USES OF GLOW LAMPS

### NIGHT LIGHT

The Glow Lamp may be used as a night light around the home, in the bedroom, bathroom and nursery. A great convenience in the sick-room.

### EXIT LIGHTS

Red sprayed Neon Glow Lamps provide excellent signals for exit lights and markers.

### FIRE ALARM STATIONS

Because of their long life, Glow Lamps are ideal for fire alarm stations. Replacements are not so frequent, reducing outage risks and maintenance expense.

### PANEL BOARD INDICATORS

As panelboard indicators, dependability, and long life of Glow Lamps make them useful to indicate whether the panel is "hot" or not as a safety precaution.

### HIGH-VOLTAGE INDICATOR

Glow Lamps can frequently be capacitively coupled to high-tension circuits to indicate when lines are "hot."

### MOTOR SPEED TESTS

From a chalk mark on the end of a motor shaft, rotating under stroboscopic light from Glow Lamps, "slip" can be measured easily.

### ELECTRIC IRON

Domestic current-consuming devices can also use the Glow Lamp to indicate whether they are in operation or not.

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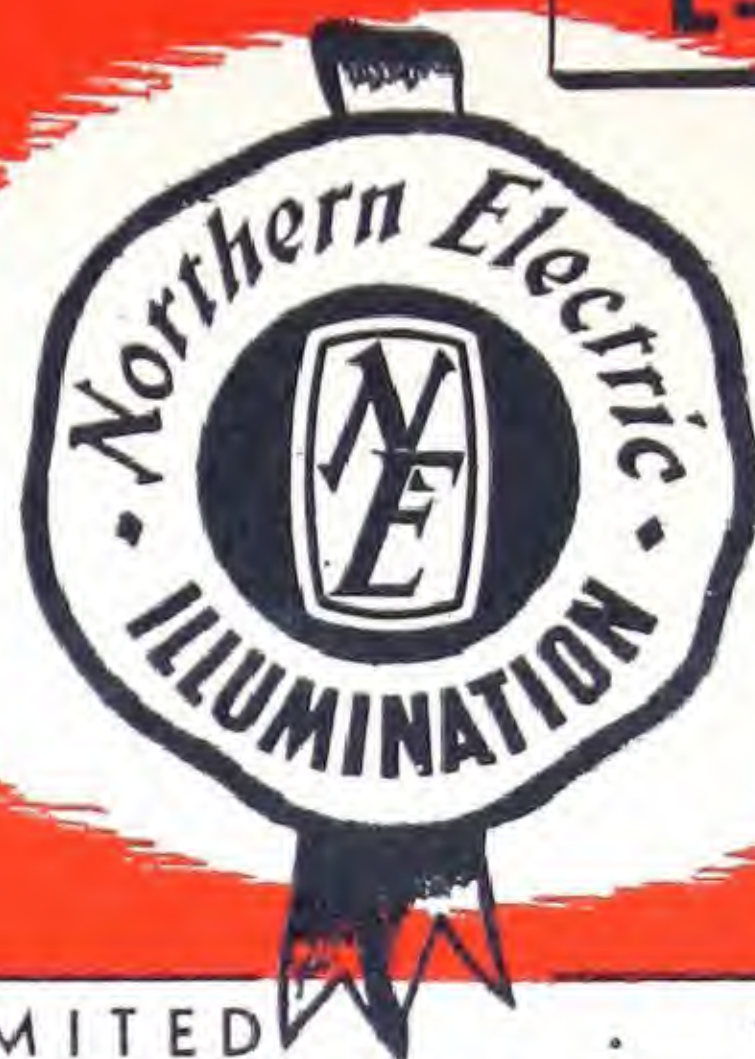
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# Nor-Lectric BULLETIN

August 1944

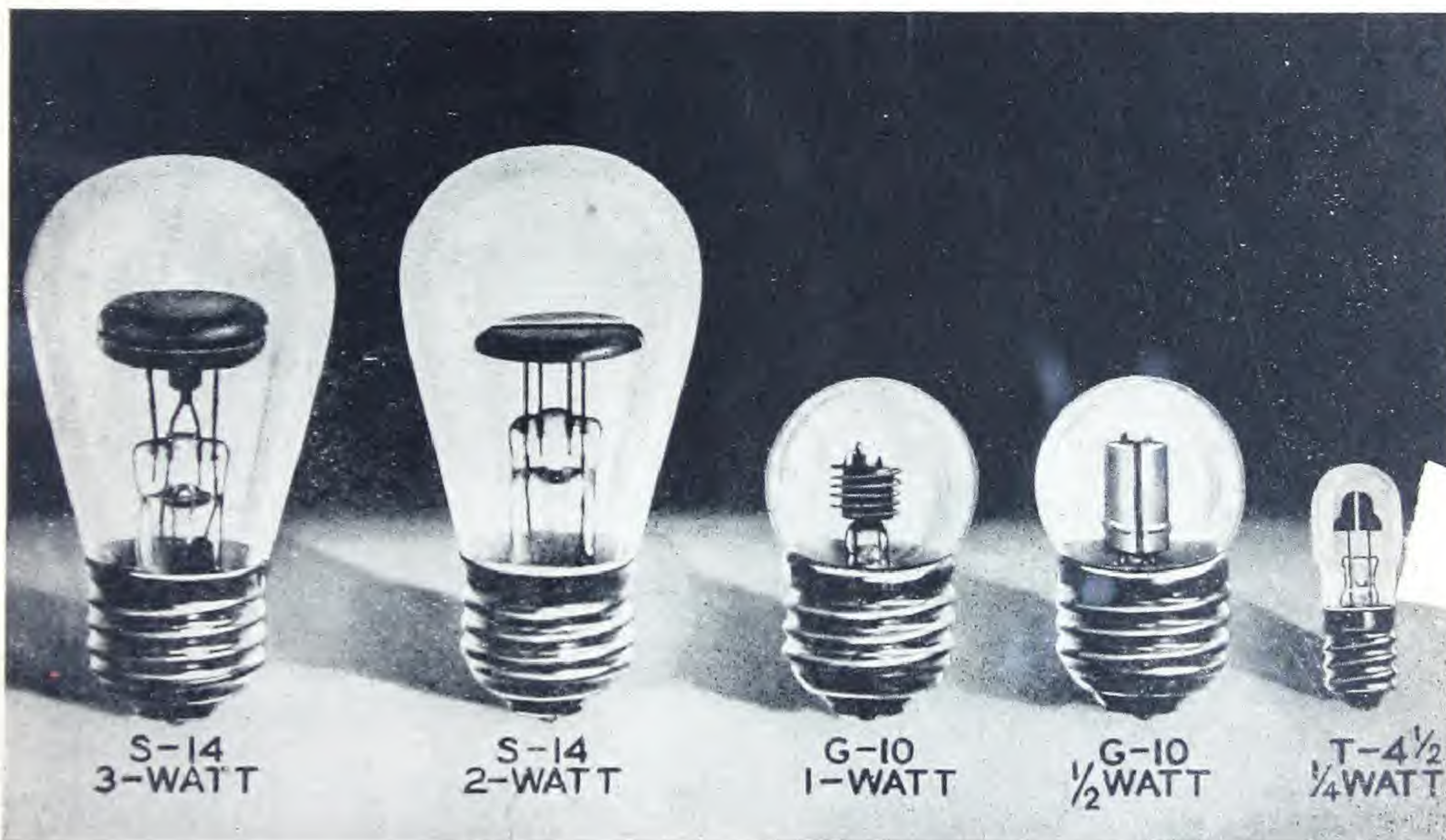
L-1-3



PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

## NEON AND ARGON GLOW LAMPS



Glow Lamps, a modern electrical device, produce light through the agency of electrically excited rare gases. The lamps operate directly from commercial lighting circuits, no accessory devices being required.

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## STANDARD NEON AND ARGON GLOW LAMPS—115-125 VOLTS

ILLUSTRATED ON PREVIOUS PAGE

### UNIT PACKAGE 10: STANDARD PACKAGE 100

Watts	Starting Volts below mini- mum marking on base		Cur- rent Rating Amps. at 120 Volts	Approx. Resistance in Base Ohms*	Bulb	Finish†	Screw Base	Service‡	Useful Life Hours at 120 Volts	Electrode Shape	Gas	Overall Length, Inches	List Price
	A.C.	D.C.											
3	60	25	.030	2200	S-14	Clear	Med.†	A.C.-D.C.	3000	Rnd. Plates	Neon	3-9/32	\$0.80
2	60	25	.020	3500	S-14	Clear	Med.†	A.C.-D.C.	3000	Half Round Plates	Neon	3-9/32	.70
2	60	25	.020	3500	S-14	Sprayed Red or Yellow	Med.†	A.C.-D.C.	3000	Half Round Plates	Neon	3-9/32	.78
2½	60	25	.025	2500	S-14	Clear only	Med.†	A.C.-D.C.	3000	Half Round Plates	Argon	3-9/32	.70
½*	20	—	.005	3500	G-10	Clear	Med.†	A.C. only	3000	Cylinder	Neon	1-63/64	.60
1	60	25	.010	4800	G-10	Clear	Med.†	A.C.-D.C.	3000	Cy. & Helix	Neon	1-63/64	.60
¼	60	25	.002	30,000	T-4½	Clear only	Cand.	A.C.-D.C.	3000	Hemisphere	Neon	1½	.60
¼	40	—	.003	20,000	T-4½	Clear only	Cand.	A.C. only	1000	Hemisphere	Argon	1½	.70

\*Supplied in 1 Watt size for 210-240 Volt—A.C. or D.C. Service—Medium Screw Base only. List .60 each.

†Will be supplied in Skirted Candelabra Screw Base 8c additional list.

\*Lamps will be furnished without resistance, only when equipped with Double Contact Bayonet base of corresponding size at 8c additional. S-14 bulb will be equipped with Skirted Double Contact Bayonet Candelabra base at 8c additional.

‡On direct current only one (the negative) electrode glows, but gives same C.P. as do both electrodes on A.C.

†Lamps listed in clear finish will be supplied with sprayed red or yellow finish at 8c additional, except ½ watt sizes.

**NOTE:—Normal Light output is obtained at voltage range shown; lamps will operate at reduced light output down to starting voltage shown.**

## WHY GLOW LAMPS ARE USED

Glow Lamps are selected for innumerable uses because of:

1. Low current consumption
2. Insignificant heat
3. Reliability
4. Long life
5. Wide voltage range
6. Ruggedness

The low current consumption is indicated by the current range, which is from only .002 ampere for the smallest to .030 ampere for the largest lamp now manufactured.

On direct current only one (the negative) electrode glows, but gives the same light output as do both electrodes on alternating current.

Having no filament, Glow Lamps produce a negligible amount of heat and withstand shock and vibration to an unusual degree. They may be subjected to voltage variations without greatly affecting either life or light output. They have an average useful life of 3,000 hours.

These lamps are extremely dependable. Unlike other lamps, they do not suddenly fail at the end of some definite period but slowly decrease in light output; gradual disintegration causing the walls of the bulb to slowly darken and this is accompanied by an increasing cathode drop so that, after 3,000 hours' use, the light output has dropped to 70% of its initial value. This process continues until the lamp is no longer useful as a light giving device. Unless the lamps are broken, or subjected to a mechanical shock sufficiently violent to short-circuit the electrodes, they will not suddenly fail. This reliability recommends them for many unusual uses.



## WHERE GLOW LAMPS ARE USED

The unique characteristics of the glow lamp lend themselves to many applications and uses which would be quite impossible with devices not possessing these characteristics. Its ability to produce light at low energy levels suggests its use as a signal or pilot in circuits where low current drain is desirable as in radio circuits, "B" battery-operated devices and high-resistance circuits. It may be used in capacitively or inductively-coupled circuits where little current may be drawn.

### AS A TEST LAMP

- (1) Circuit alive—circuit continuity.
- (2) By brilliancy, whether 110 or 220 volts.
- (3) By flicker, if 25 cycle.
- (4) Polarity (only negative glows on direct current).
- (5) Grounded neutral wire. Holding one lead in hand and touching separately each of 3 legs of a 3-wire system with the other lead, the two live lines will cause a glow. Lamp will not light on grounded neutral.

High sensitivity suits the lamp to many high resistance tests, such as checking leakage in capacitors (Fig. 1); leakage between tube elements; leaks in insulating material (Fig. 2); conductivity of liquids (Fig. 3) and many similar uses. If the lamp should prove to be too sensitive, showing up conditions which may not be particularly serious, the lamp sensitivity may be regulated by shunting a high resistance across it.

### AS A SIGNAL OR PILOT LAMP

In many cases, the lamp may be permanently connected in a production line or on a machine to indicate the occurrence of certain conditions. It might be used as an indicator of any of the conditions mentioned under the heading "As a Test Lamp."

As a low-current, dependable, long-life pilot lamp, the glow lamp is outstanding and has already been used extensively on all kinds of electrically-heated or operated devices, as well as for exit lights, fire station markers and location signals for valves, switches or other emergency control units.

Some further pilot lamp applications are shown in the following sketches.

Many other adaptations may be made of the critical breakdown voltage of the glow lamp by connecting it across resistors, chokes or current transformers so chosen that the normal drop across the lamp is below breakdown. Then, any condition which causes the voltage to reach the breakdown value will be indicated by a glow in the lamp.

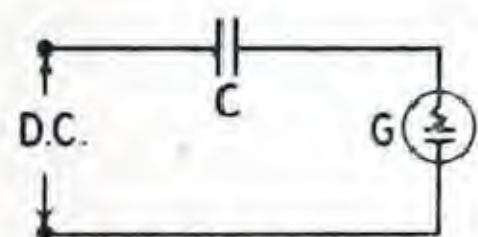


FIG. 1

A glow lamp as an indicator of short circuits or high resistance leaks in capacitors.

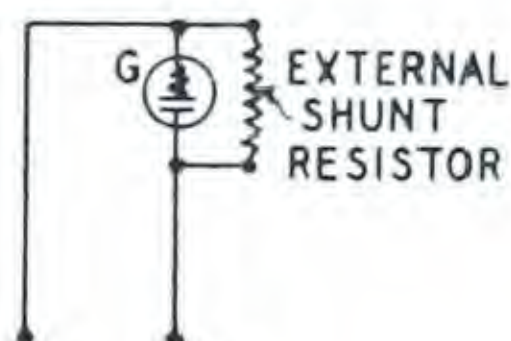


FIG. 4

Shunt resistors may be used to regulate the sensitivity of glow lamps.

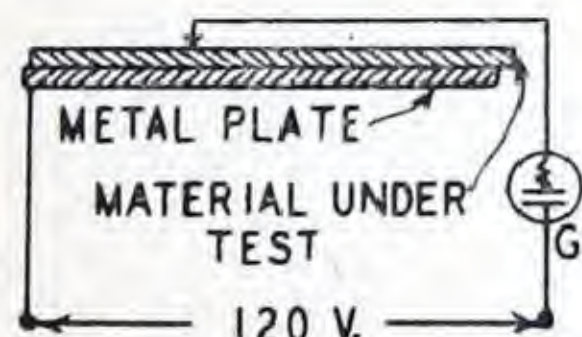


FIG. 2

A glow lamp used to test insulating paper, cloth or other materials.

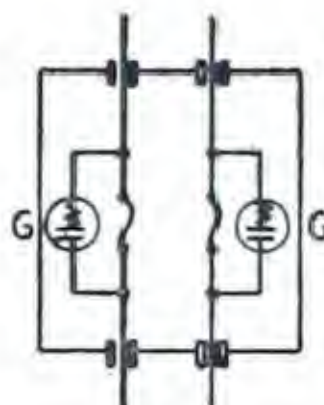


FIG. 5

When a fuse blows, the corresponding glow lamp lights.

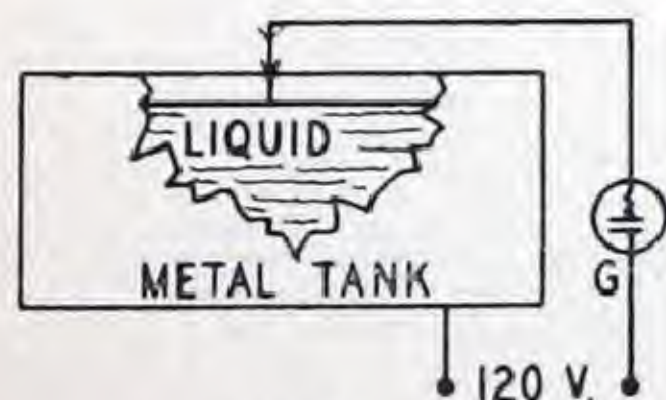


FIG. 3

A glow lamp used to check conductivity of liquids.

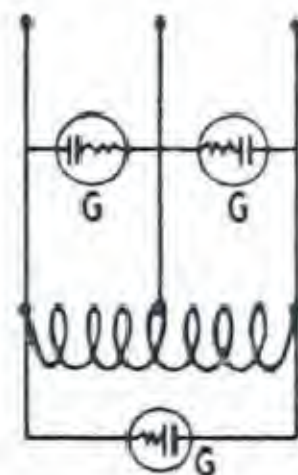
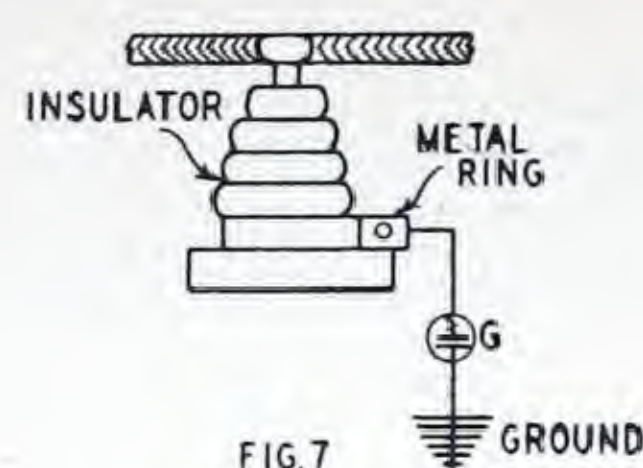


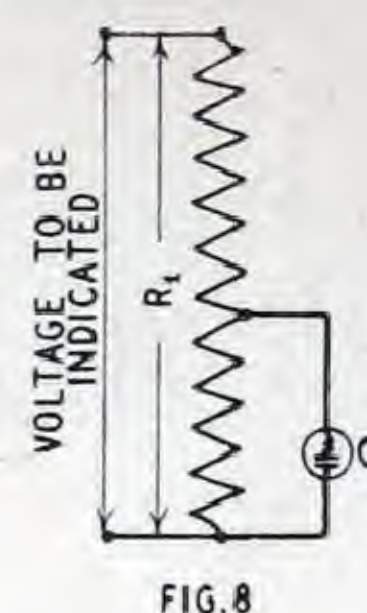
FIG. 6

Serious unbalance is indicated by change in brightness or extinguishing of glow lamp.



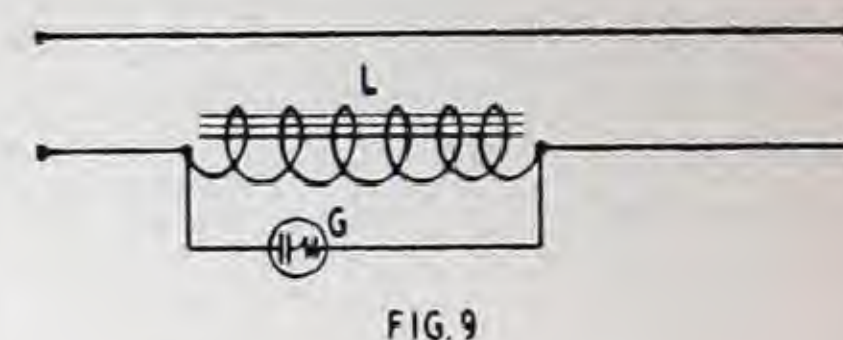


Capacitively connected to high-tension line, the glow lamp indicates when line is alive.



As a visual voltmeter when desired voltage develops across  $R_1$ , the voltage across the lamp rises to the breakdown value, causing it to light.

value



Connection to indicate voltage breakdown value.

## OTHER USES OF GLOW LAMPS

### NIGHT LIGHT

The Glow Lamp may be used as a night light around the home, in the bedroom, bathroom and nursery. A great convenience in the sick-room.

### EXIT LIGHTS

Red sprayed Neon Glow Lamps provide excellent signals for exit lights and markers.

### FIRE ALARM STATIONS

Because of their long life, Glow Lamps are ideal for fire alarm stations. Replacements are not so frequent, reducing outage risks and maintenance expense.

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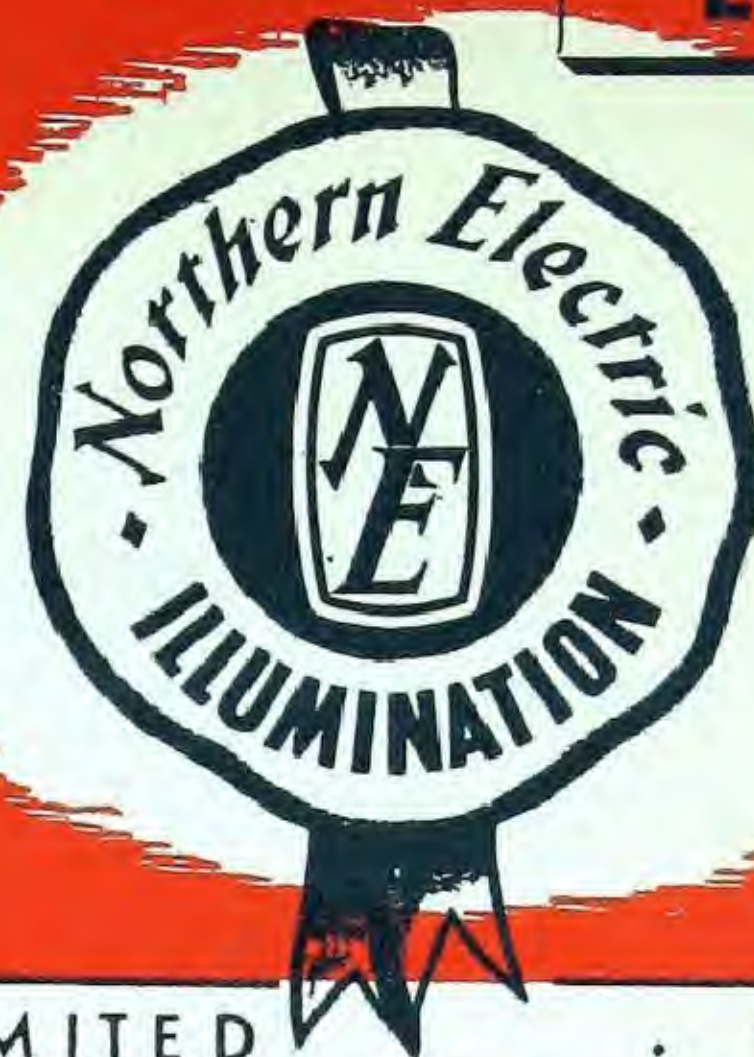


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November 1944

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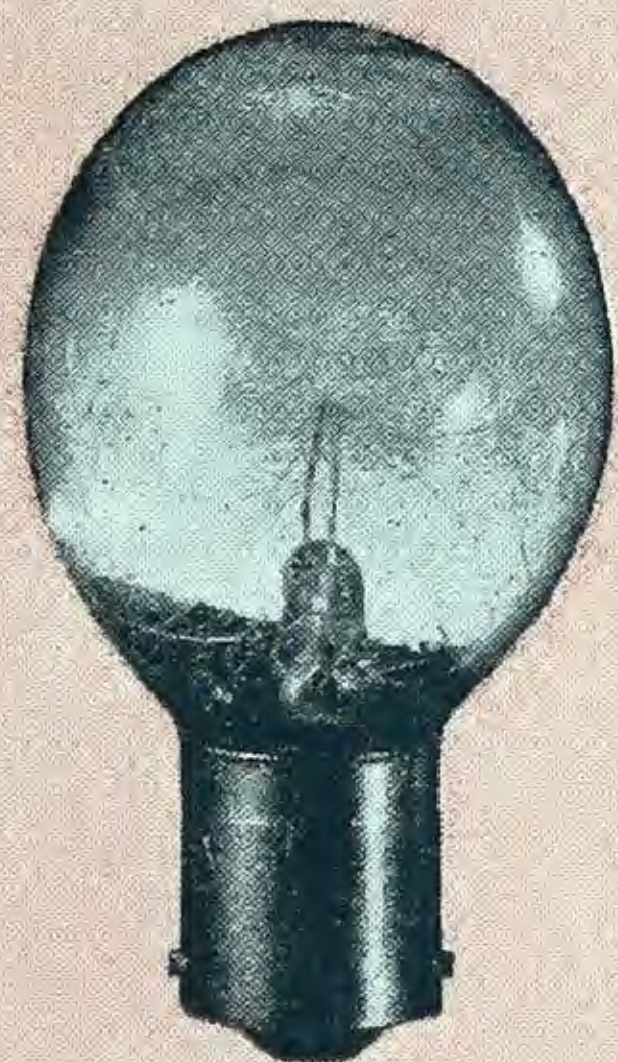
# BULLETIN



PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

## MAZDA PHOTO LAMPS



*Twice The Size Of A Peanut!*

Three Midget Photo Flash Lamps may be carried in your hand

Six go into your pocket.

(Illustration actual size).

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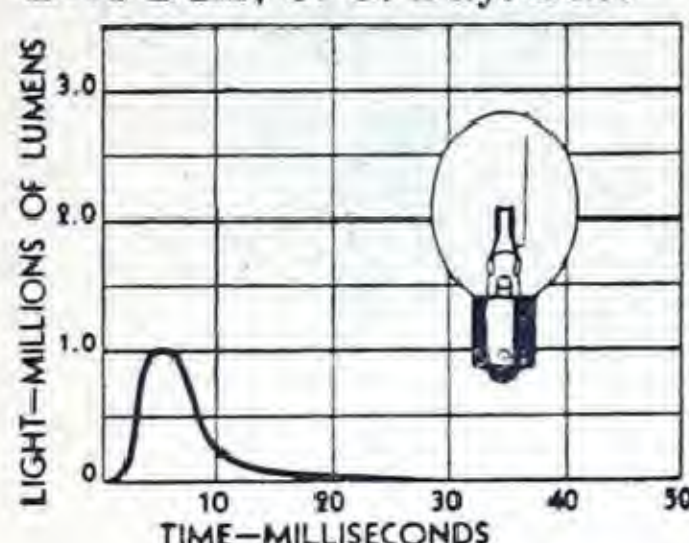
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# MAZDA PHOTOFLASH LAMPS

## SPEED MIDGET SM

B-11 Bulb, S. C. Bay. Base



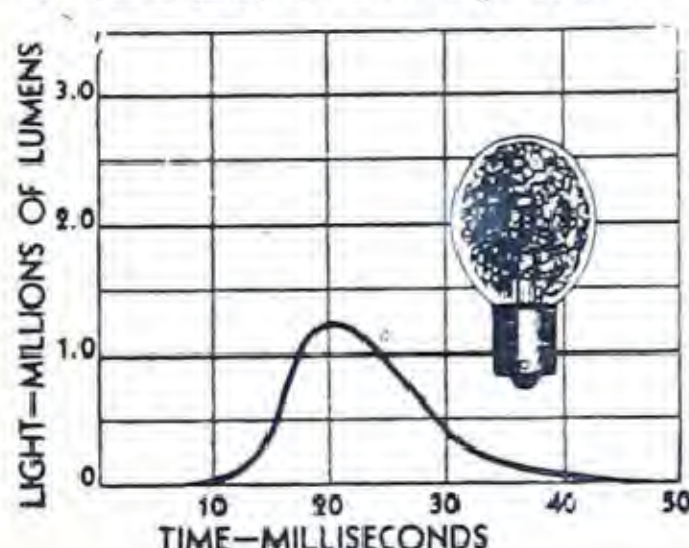
Total light: 4,500 - 5,000 lumen seconds. Approx. peak lumens 1,000,000.

Duration at  $\frac{1}{2}$  peak: 5 milliseconds (1/200 second).

Swift, low-intensity flash. For all-around near-distance pictures, in proper reflectors. Stops action on "open" flash about as effectively as a 1/200th second shutter setting. Synchronization is simple, accurate and positive, with special synchronizers. For battery flashing only.

## SYNCHRO-PRESS No. 5

B-11 Bulb, S. C. Bay. Base



Total light: 17,000-19,000 lumen seconds.

Approx. peak lumens 1,300,000.

Duration at  $\frac{1}{2}$  peak: 12 milliseconds (approx. 1/80 second).

Excellent for all-around flash pictures in proper reflectors. Precise, uniform, split-second flash, ideal for synchronized use with between-the-lens shutters. Bayonet base permits quick change, holds bulb tight in accurate position. Adapters fit it to present equipment. Six go into a coat pocket. For battery flashing only.

## SYNCHRO-PRESS No. 5B (Blue Filter)



Total light: 5,000-7,000 lumen seconds.

Approx. peak lumens 400,000.

Duration at  $\frac{1}{2}$  peak: 12 milliseconds (approx. 1/80 second).

Same construction as Synchro-Press No. 5, with blue filter coating for correct reproduction with daylight type color film. An excellent lamp as the sole source of illumination for daylight film without filter or to supplement daylight in outdoor color shots.

Like all midget lamps, the No. 5B should be used in reflectors especially designed for lamps having the small size (B-11) bulb.

**SCREW BASE LAMPS.** Which photoflash lamp to use is easily decided by comparing the important features of groups of lamps. The familiar screw base photoflash lamps are for average reflectors furnished with synchronizers and for studio reflectors. A comparison of the time-light characteristic curves shows two types of performance. Lamps No 11 and 22 are similar and may be used interchangeably with any synchronizer set to hit the 20-millisecond peak. Thus, two bulb sizes and two degrees of light are available for use in such screw base equipments. Lamp No. 31 is made for focal plane synchronization only.

**MIDGET LAMPS.** Flash users now realize that midget Mazda Photoflash lamps used in properly designed reflectors can duplicate practically any flash picture made with screw base types. The No. 5, for example, can equal or outperform lamps like the No. 11 in the average reflectors with which such lamps are used. Midgets are preferred because of their handy size, ease in carrying and use.

The No. 5 is designed to work with conventional synchronizers adjusted so that the shutter is fully open at 20 milliseconds.

The No. 6 is for synchronization with most focal plane cameras of sizes up to and including  $3\frac{1}{4} \times 4\frac{1}{4}$ .

The Speed Midget SM is unique. It produces light by burning solid material massed on the lead-in wires. It reaches peak light in 5 milliseconds—four times faster than other photoflash lamps. This is the same time needed for most cocking-type shutters (Supermatic, Diomatic, Kodamatic, Compur) to get wide open after tripping. A synchronizer that starts lamp current and shutter-trip simultaneously is effective at any shutter speed. The flash is over swiftly—its action-stopping power on open flash being about equal to 1/200th shutter setting.

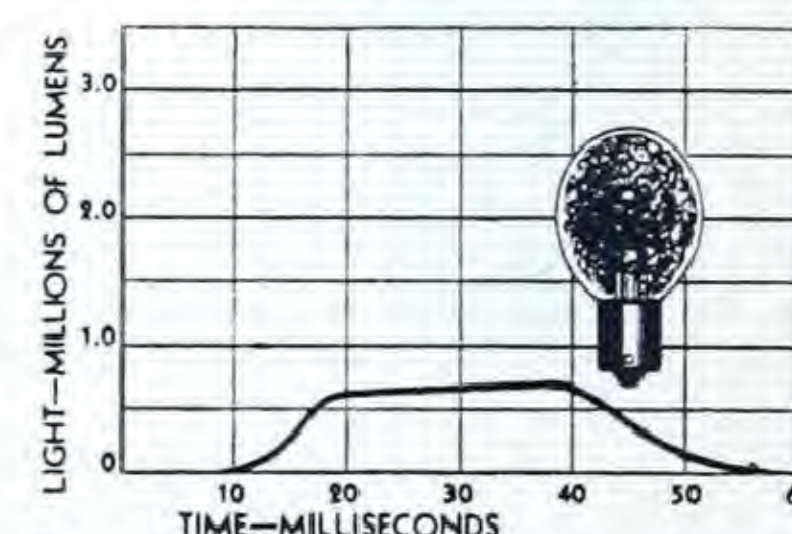
## FOCAL PLANE No. 6

B-11 Bulb, S. C. Bay. Base

Total light: 16,000-18,000 lumen seconds.

Approximate peak lumens 700,000.

Duration at  $\frac{1}{2}$  peak: 30 milliseconds (approx. 1/30 second).



Especially effective in concentrating reflectors. For battery flashing only.

For high shutter speed synchronization with all focal plane shutters except those requiring the ultra-long peak of the No. 31 lamp. This includes most cameras up to  $3\frac{1}{4} \times 4\frac{1}{4}$ . Bayonet base for quick handling, secure contact. Midget size and convenience.

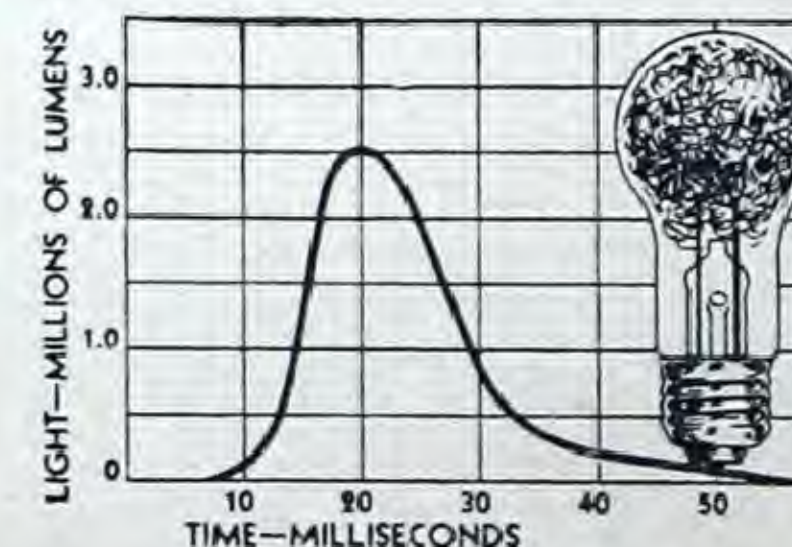
## SYNCHRO-PRESS No. 11

A-15 Bulb, Medium Screw Base

Total light: 30,000-35,000 lumen seconds.

Approximate peak lumens 2,500,000.

Duration at  $\frac{1}{2}$  peak: 9 milliseconds (approx. 1/100 second).



Small, general-purpose lamp for open-flash shots, and for accurate synchronizers in press and amateur use, with between-the-lens shutters. Excellent for low-cost cameras with built-in synchronization. For battery flashing only.



## MAZDA PHOTOFLASH LAMPS

**MULTIPLE FLASH.** All Mazda photoflash lamps are designed to flash uniformly and accurately when used in pairs—one at the camera, one on an extension cord not more than 25 feet long. No adjustment in synchronization is necessary.

**CURRENT USED.** The same current, as little as that furnished by two pen-lite cells, will flash all Mazda photoflash lamps.

**BATTERIES.** Fresh battery cells are important to best performance of photoflash lamps. Worn-out cells and low cell temperatures result in erratic synchronization.

Age, use and condition of equipment contribute to the need for replacement for which no rule-of-thumb is possible.

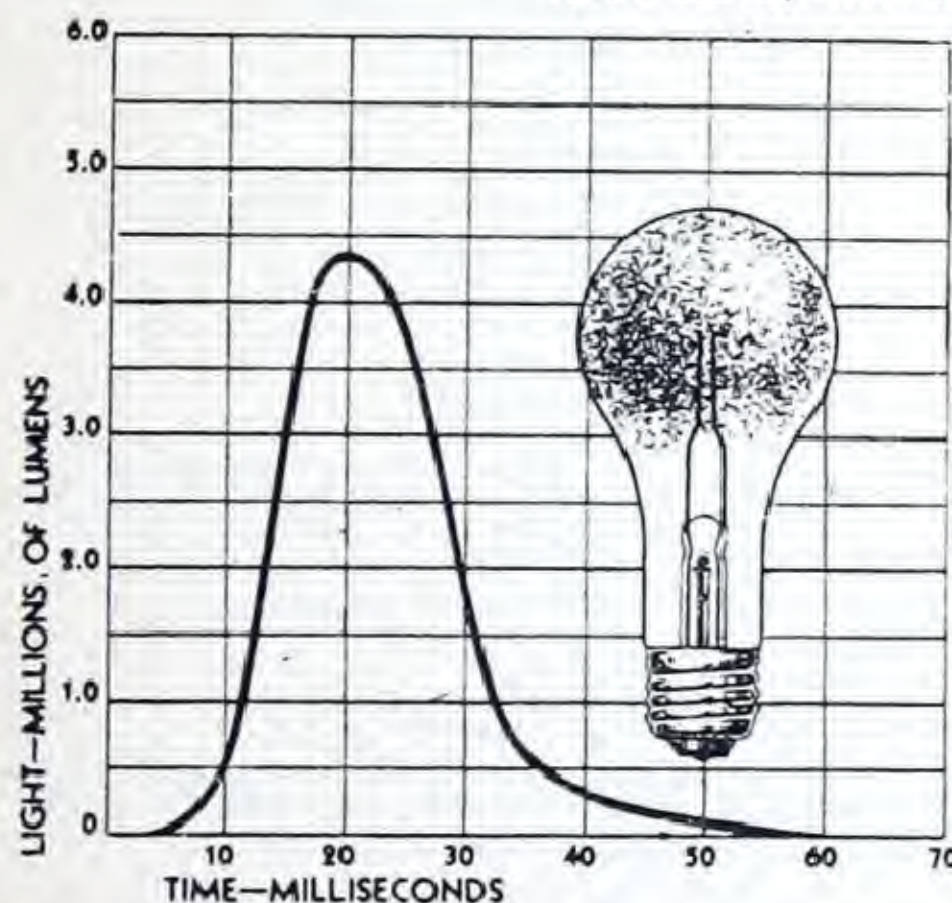
**RESISTANCE.** For split second accuracy of lamp, synchronizer, and shutter performance it is important that no current be wasted by poor contacts or inadequate wiring. Clean, tight contacts are especially important now because substitute materials must be used for many parts. For example, it is important that the solder contact at the bottom of the lamp base be clean (put on emery cloth, sandpaper, or fabric) before inserting the lamp in the flash gun. Connecting wires and extension cords should be as heavy as practical. Lamps should be firmly seated in sockets.

**SHATTERING.** Lamps handled roughly may shatter on flashing. Mazda photoflash lamps have a strong inside and outside coating to minimize risk to photographer and subject. The outside coat also serves to protect the glass from accidental injury prior to flashing.

**REFLECTORS.** To put the greatest amount of light in the useful picture zone, properly designed reflectors must be used. Some, designed for large lamps, concentrate the light from Midget lamps too much. Others waste light by spreading it far outside the picture area. For this reason, best results with Midget lamps are obtained with reflectors designed especially for this bulb size.

### SYNCHRO-PRESS No. 22

A-19 Bulb, Medium Screw Base



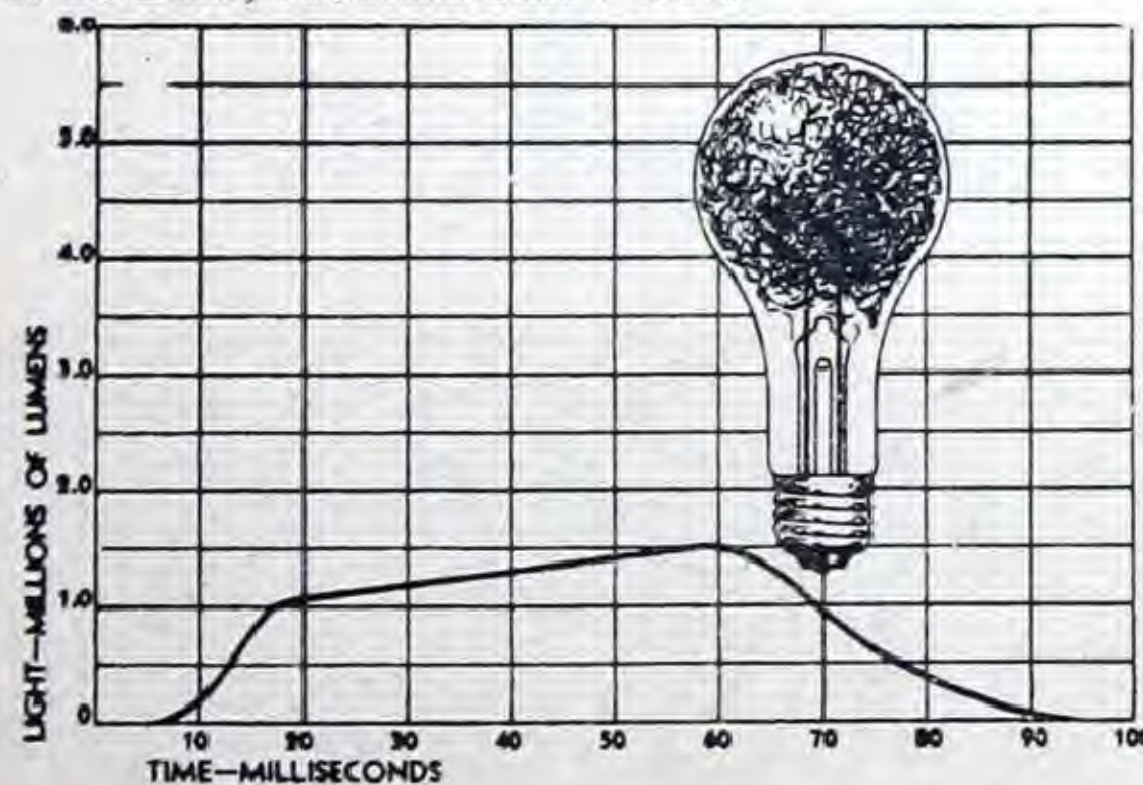
Total light: 70,000-75,000 lumen seconds.

Approx. peak lumens 4,300,000. Duration at  $\frac{1}{2}$  peak: 15 milliseconds (approx.  $\frac{1}{70}$  second).

Synchro-Press No. 22 is a general purpose lamp of greater power than the No. 11 for open shots, and for accurate synchronizers. It has a medium broad peak to allow for errors in synchronization. For use with front-shutter cameras, the lamp provides plenty of peak light for extra coverage and high-speed shots.

### FOCAL PLANE No. 31

A-21 Bulb, Medium Screw Base



Total light: 80,000-90,000 lumen seconds.

Approximate peak lumens 1,500,000. Duration at  $\frac{1}{2}$  peak: 53 milliseconds (approx.  $\frac{1}{20}$  second).

For high shutter speed synchronization with focal plane shutters for 4 x 5 negative size and less. The ultra-long peak of illumination provides ample light on the subject during the full time the shutter is open. For battery flashing only.

## MAZDA PHOTOFLOOD LAMPS



### PHOTOFLOOD

#### No. 1

Same size as a standard 60-watt lamp, drawing 250 watts at 115 volts (2.2 amperes), yet photographically equal to as much as 750 watts in standard lighting lamps. As many as six No. 1 Photoflood lamps may be safely used on one regular house lighting circuit. Rated life: 3 hours at 115 volts.



### PHOTOFLOOD Nos. 2, B2

Same size as a standard 150-watt lighting lamp, drawing 500 watts at 115 volts, yet equal to 1500 watts in standard lighting lamps.

The No. 2 is an inside frosted bulb; the B2 an inside frosted daylight bulb. Three No. 2 lamps may be safely used on one house lighting circuit. Rated life: 6 hours at 115 volts.



### PHOTOFLOOD

#### No. 4

Same size and shape as the regular 300-watt general service MAZDA lamp with mogul screw base. Draws 8.7 amperes at 115 volts. Easily  $2\frac{1}{2}$  times as effective photographically as the regular 1000-watt lamp. Rated life: 10 hours at 115 volts.





### PHOTOFLOOD No. R2


Gives a smooth 60-degree controlled beam. Highly reflective inside surface of mirror aluminum in reflector-shaped bulb. Draws 500 watts at 115 volts (4.4 amperes), yet photographically equal to 1500 watts in standard lighting lamps in good reflectors. Three may be safely used on one regular house lighting circuit. Rated life: 6 hours at 115 volts.



## EDISON MAZDA PHOTOENLARGER LAMPS

	<b>PHOTOENLARGER</b>  <b>No. 111</b>
<p>A small, white-bulb, high-efficiency lamp with bayonet base. For use in some miniature enlargers. The smooth white glass provides excellent diffusion, gives smooth distribution of light. Will not discolor or become scratched. Approximate watts: 75.</p>	

	<b>PHOTOENLARGER</b>  <b>No. 212</b>
<p>High-efficiency, white-bulb lamp. Excellent diffusion and light distribution. No. 212 is 150 watts (photo-flood type—3-hour life) approximate.</p>	

	<b>PHOTOENLARGER</b>  <b>No. 302</b>
<p>High-efficiency, white-bulb lamp. No. 302 at 500 watts—photo-flood type—6-hour life, approximate. Fits many leading professional enlargers. Excellent diffusion and light distribution.</p>	

This bulletin is based on information furnished by the Canadian General Electric Company Limited, manufacturers of Edison Mazda Lamps.

## OTHER STANDARD VOLTAGE LAMPS USED IN PHOTOGRAPHY

### FLUORESCENT LIGHT FOR PHOTOGRAPHY

Since the introduction of the fluorescent lamp in 1938, its photographic use has been recognized. It has become increasingly popular and various types of reflectors and equipment have been manufactured to accommodate fluorescent lamps in the photographer's studio. The fluorescent lamp is at present available in 9, 18, 24, 36, 48 and 60 inch lengths. White and daylight types are the two of most interest to photographers. The most outstanding photographic features of the fluorescent lamp are its low radiant heat which is about one-half that of equal wattage filament lamps.

Fluorescent lamps give portraits a quality like that obtained with daylight.

### PROJECTION LAMPS

The precision construction and advanced design features of Mazda projection lamps mean superior screen results, more efficient light control, minimum loss of light during life. The best guide to the proper size of lamp to be used in equipment is the recommendation of the projector manufacturer.

The line of *Edison Mazda* projection lamps is complete for all types of projectors.

### SPECIAL LAMPS FOR HOME PORTRAIT EQUIPMENT

The 500-watt clear T-20 and the 500-watt blue T-20—for use in compact, portable, general lighting equipment where a relatively concentrated light source is desirable.

### SPOT LIGHT LAMPS

For controlled light in spot light equipment, the G-30, 400-watt, clear and photo blue lamp is widely used.

### PHOTO ENLARGER LAMPS

Only popular sizes of enlarger lamps are listed here and in the Mazda line are many other sizes and types. Use of the correct lamp in any enlarger will assure uniform print quality.

### COLOR PHOTOGRAPHY LAMPS

Special lamps for color photography are also available and information may be obtained on request.

## DARK ROOM LAMPS

Darkroom lamps are available in *amber* and *ruby* glass, in 10-, 25-, 40- and 60-watt size



10-Watt S-14



25-Watt A-19



40 and 60-Watt A-21

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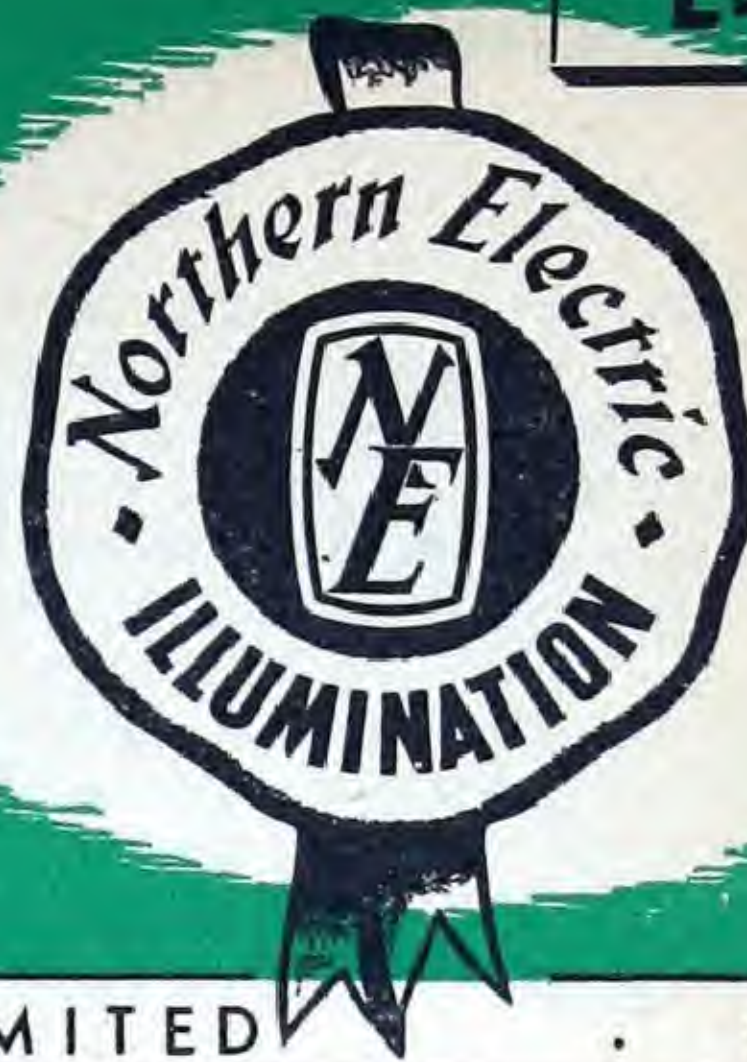
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March 1944

L-3-4

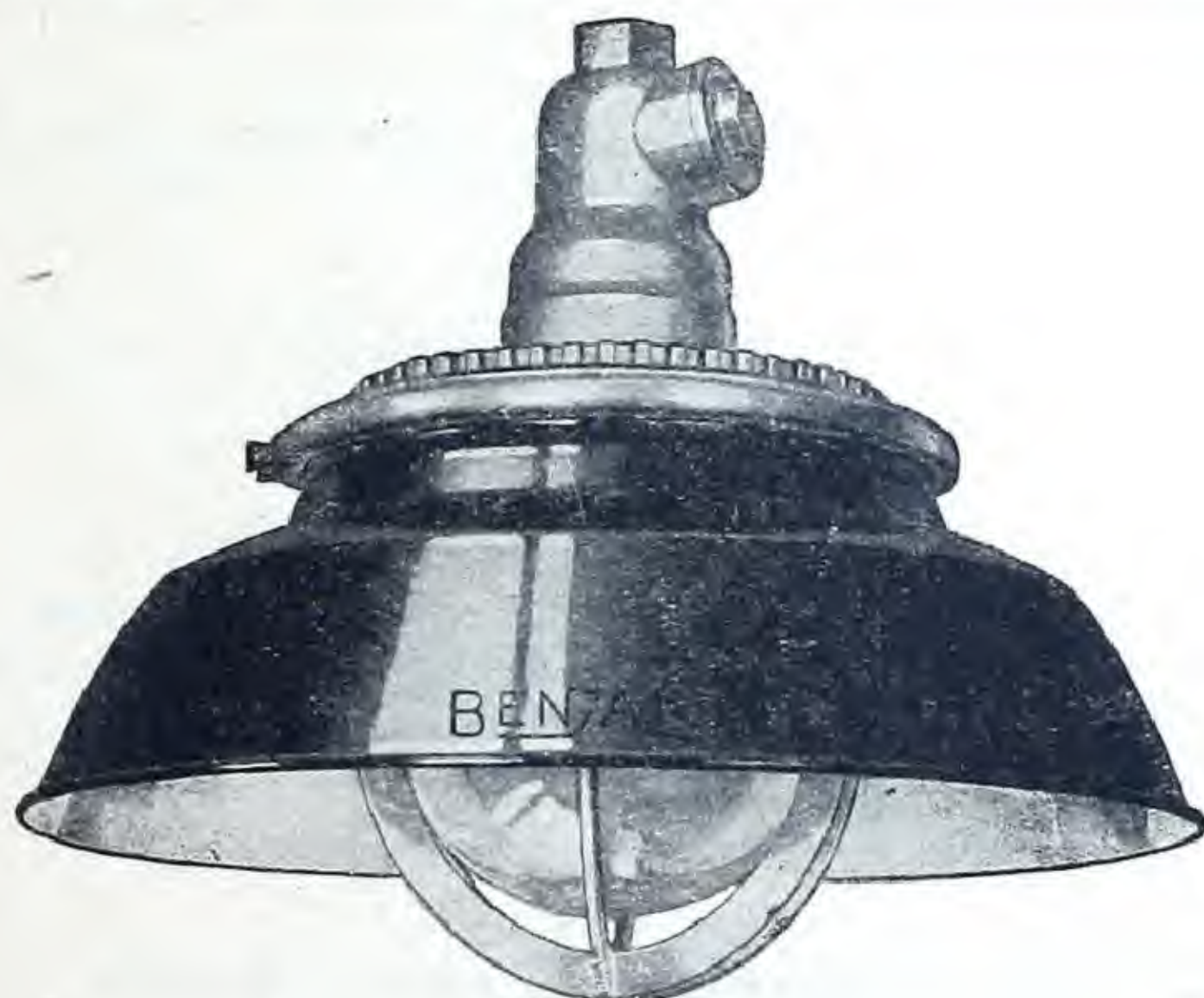


PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

AMALGAMATED

## EXPLOSION PROOF LIGHTING FIXTURES



Cat. No. 7613

Listed by Underwriters' Laboratories for Class I,  
Groups C and D Hazardous Locations

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# Safe Lighting of Hazardous Locations

Recent years have seen the development of many highly inflammable and explosive materials in industry. As increased use and production of these materials has resulted in serious fires and explosions, it has become apparent that special precautions are required for electrical installations in such locations.

Accordingly, Section 32 of the Canadian Electrical Code classifies the various hazardous locations as follows:

## Class I Locations

### Class I, Group A

Atmospheres containing acetylene.

### Class I, Group B

Atmospheres containing hydrogen or gases or vapors of equivalent hazard, such as manufactured gas.

### Class I, Group C

Atmospheres containing ethyl ether vapor.

### Class I, Group D

Atmospheres containing gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, and natural gas.

Class I Locations include dry-cleaning plants, petroleum refineries, bulk oil stations, gasoline filling stations, gas plants, spray painting establishments, dip tank painting processes, chemical plants, artificial silk factories, pyroxylin plastic factories, fabric and paper coating plants, the rubber industry, the leather and shoe industry, hospitals, soap factories, etc.

## Class II Locations

### Class II, Group E

Atmospheres containing metal dust.

### Class II, Group F

Atmospheres containing carbon black, coal or coke dust.

### Class II, Group G

Atmospheres containing grain dust.

Class II Locations include flour mills, feed mills, grain elevators, starch plants, sugar, cocoa and coal pulverizing plants and establishments or industries involving similar hazardous processes or conditions.

## Class III Locations

### Class III

Locations in which easily ignitable fibres or materials producing combustible flyings are handled, manufactured or used, and which are hazardous through such fibres or flyings collecting on or being ignited by arcing contacts, resistors, lamps or similar apparatus.

This class may include locations such as some parts of cotton and other textile mills, combustible fibre manufacturing plants, cotton gins, clothing manufacturing plants, cotton-seed mills, wood-working plants, and establishments or industries involving similar hazardous processes or conditions.

## Class IV Locations

### Class IV

Locations in which easily ignitable combustible fibres are stored or handled and which are hazardous through such fibres being ignited by arcing contacts, resistors, lamps, or similar apparatus.

This class may include locations such as warehouses in which are stored or handled combustible fibres such as cotton (including cotton linters and cotton waste), sisal or henequin, ixtle, jute, hemp, tow, cocoa fibre, oakum, baled waste, kapok, Spanish moss, excelsior, and other similarly readily ignitable fibres.

## Lighting Fixture Specifications

The prime requirement of fixtures for Class I locations, Groups A to D inclusive, is that they must be explosion-proof. Design and construction must be able to withstand the pressure of internal explosions and prevent sparks or flames from escaping and reaching the explosive or inflammable atmosphere surrounding the fixture.

Fixtures for Class II, Groups E, F and G must be dust-tight and of such design as to prevent the development of temperatures on outside surfaces sufficient to cause overheating or ignition of the dust.

Fixtures for use in Classes III and IV, hazardous locations, must be designed and built to prevent the collection of ignitable fibres and flyings where they may be ignited by arcing contacts, resistors, lamps or similar apparatus, as specified by the Underwriters' Laboratories, Inc.

## Benjamin Protective Lighting Equipment Meets Specifications

The Benjamin lighting fixtures and equipment described in this bulletin have been carefully designed to provide the maximum lighting efficiency and adequate protection in specific hazardous locations under the Canadian Electrical Code. All have passed the rigid tests of the Underwriters' Laboratories, Inc., for specific locations and are so approved.

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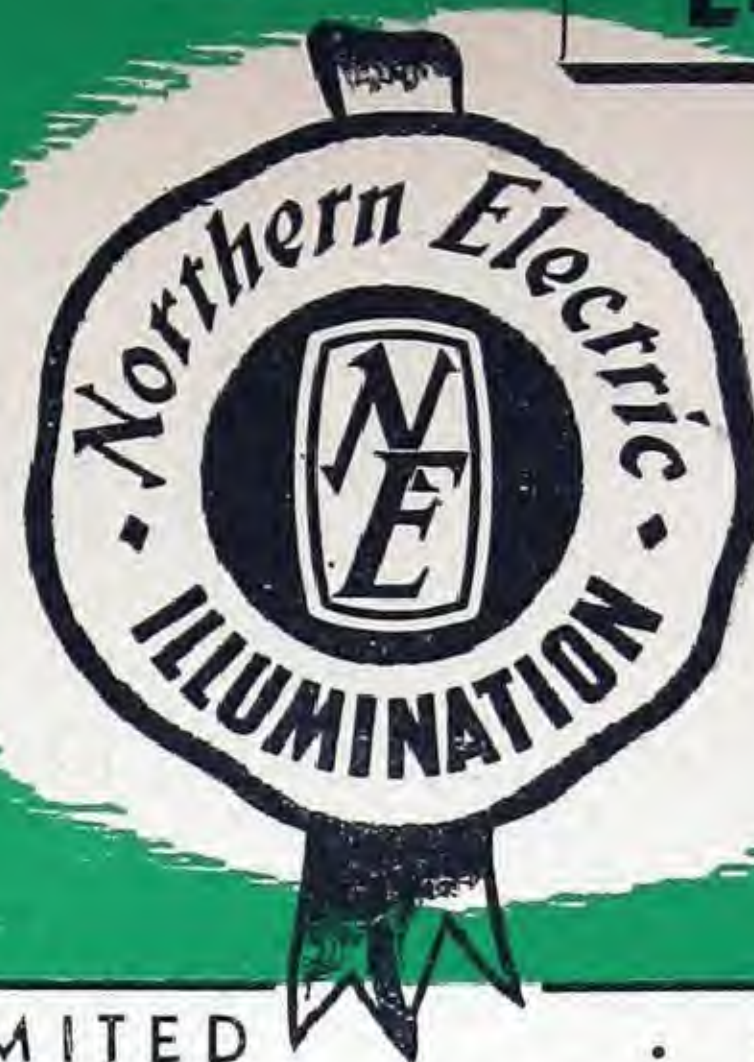
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# *Nor-Lectric* BULLETIN

October 1944

L-3-7



ISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

## LOCALIZED LIGHTING

*for Efficient  
Industrial Seeing*

Localites are a vital tool for greater speed and accuracy in industry. A worker is no better than his ability to see what he is doing. On precision work he must have the quality and quantity of illumination which is supplied by localized lighting. Good industrial lighting for intricate tasks consists of adequate general lighting supplemented by localized lighting—general lighting for the "background" and localized lighting for the "close-up."

Localites at critical work areas make for

- QUICK, ACCURATE VISION ● INCREASED SPEED
- GREATER PRECISION ● REDUCED SPOILAGE ●
- FEWER ACCIDENTS ● IMPROVED EMPLOYEE MORALE

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## Here are the Four Complete Standard Models



No. 32-H-102

Combination of No. 32 Arm, No. H Reflector Assembly and No. 102 Base Attachment—overall length 22½". For machine tools such as bench grinders and die-making equipment, small lathes, etc.



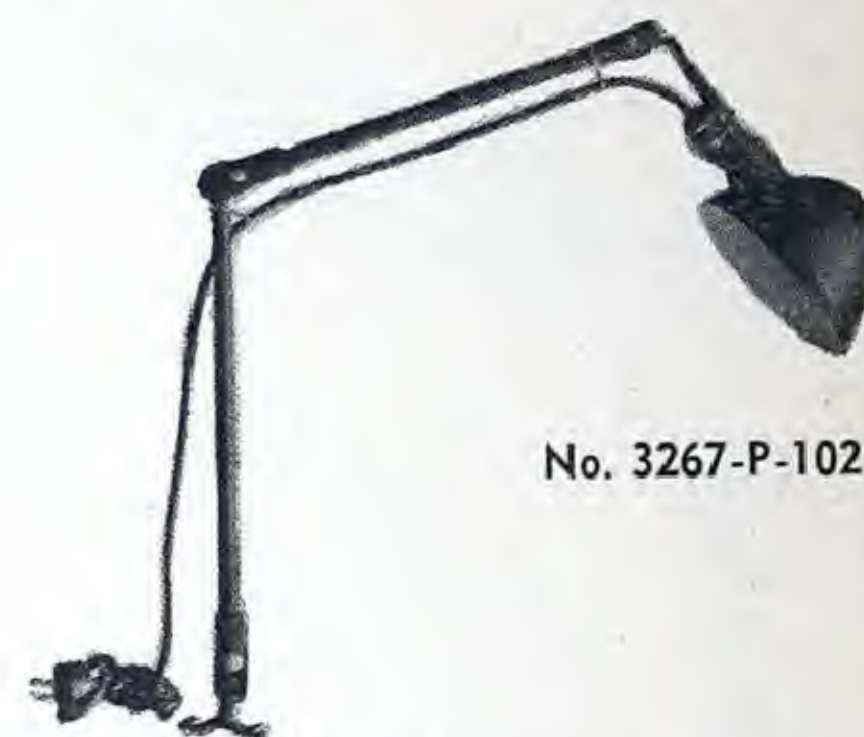
No. 3470-P-102

Combination of No. 3470 Arm, No. P Reflector Assembly and No. 102 Base Attachment—overall length 48". For table and bench where work area is large.



No. 3267-H-102

Combination of No. 3267 Arm, No. H Reflector Assembly and No. 102 Base Attachment—overall length 32½". For variety of machine tools and machinery. Used widely on lathes, boring mills, shapers, etc. Many applications in the engraving and printing industries.



No. 3267-P-102

Combination of No. 3267 Arm, No. P Reflector Assembly and No. 102 Base Attachment—overall length 34¼". For table and bench where work area is large.

*For special requirements other units can be made up using the following parts*

### REFLECTOR ASSEMBLIES

#### No. "C"



OVERALL Length 10". Diameter 6½".

ACCOMMODATES: One 60-watt medium-base lamp.

LIGHT PATTERN: Circular, 20" in diameter.

MAXIMUM INTENSITY: 135 foot-candles 12" from working surface.

FINISH: Outside wrinkle black; inside baked heat-resistant white enamel.



Foot-candles at intersections of 4" squares with 60-watt lamp 12" from working surface.

#### No. "H"



OVERALL Length 10". Width 3½".

ACCOMMODATES: One 75-watt medium-base lamp.

LIGHT PATTERN: Irregular, approximately 20" x 16".

MAXIMUM INTENSITY: 200 foot-candles 12" from working surface.

FINISH: Outside wrinkle black; inside baked heat-resistant white.

SPECIAL FEATURES: Light shield on socket end. Special swivel permits rotation of reflector 58° left or right.



Foot-candles at intersections of 4" squares with 75-watt lamp 12" from working surface.





### No. "P"

OVERALL Length 12". Diameter 6 1/2".

ACCOMMODATES: One 100-watt medium-base lamp.

LIGHT PATTERN: Circular, 28" in diameter.

MAXIMUM INTENSITY: 321 foot-candles 12" from working surface.

FINISH: Outside wrinkle black; inside baked heat-resistant white.

SPECIAL FEATURE: Swivel permits rotation of reflector 58° right or left.



Foot-candles at intersections of 4" squares with 100-watt lamp 12" from working surface.

All standard Reflector Assemblies are made with a 3/4" ball on the Reflector Arm so that each may be attached to any standard Supporting Arm—or any standard Base Attachment which is equipped with ball sockets.

## BASE ATTACHMENTS

There are six standard Base Attachments available for use in installing Fostoria Flexible Localites on machines, tables, benches, pipes, walls, floors and ceilings. All bases fit all standard Supporting Arms with the exception of No. 112, which is designed to be used directly on Reflector Assemblies. All ball-equipped Base Attachments have 1" balls. All ball-socket-equipped Base Attachments are made to accommodate a 3/4" ball.



No. 102—Height 1 1/2"; 1" ball—solid stem—rectangular pressed steel plate, punched for mounting bolts.

No. 104—Height 4"; 1" ball—hollow stem—circular cast plate, drilled for mounting bolts.

No. 105—Height 3"; 1" ball—hollow tubing threaded.

No. 106—Height 6"; same as No. 102 except higher.

No. 112—Height 3"; 3/4" ball-socket on rectangular pressed steel plate.

No. 114—Height 3"; 1" ball—2-piece clamp—expansion 3/4" to 1 1/4".

No. 166—Height 8 1/2"; 1" ball—hollow tubing circular cast plate drilled for mounting bolt.

## SUPPORTING ARMS

Made of 5/8" steel tubing with ball sockets welded in place, the Supporting Arm used on the Fostoria Localites is available in four different standard lengths and two standard types—Single Arm 2-joint and Double Arm 3-joint. All Standard Arms fit all Reflector Assemblies, since ball socket on reflector end is made to accommodate a 3/4" ball. All wire holes are bushed with approved rubber bushings. Bolts and nuts are cadmium plated. Adjustment of arms to position is accomplished quickly and easily without loosening or tightening nuts and bolts.



### SPECIFICATIONS

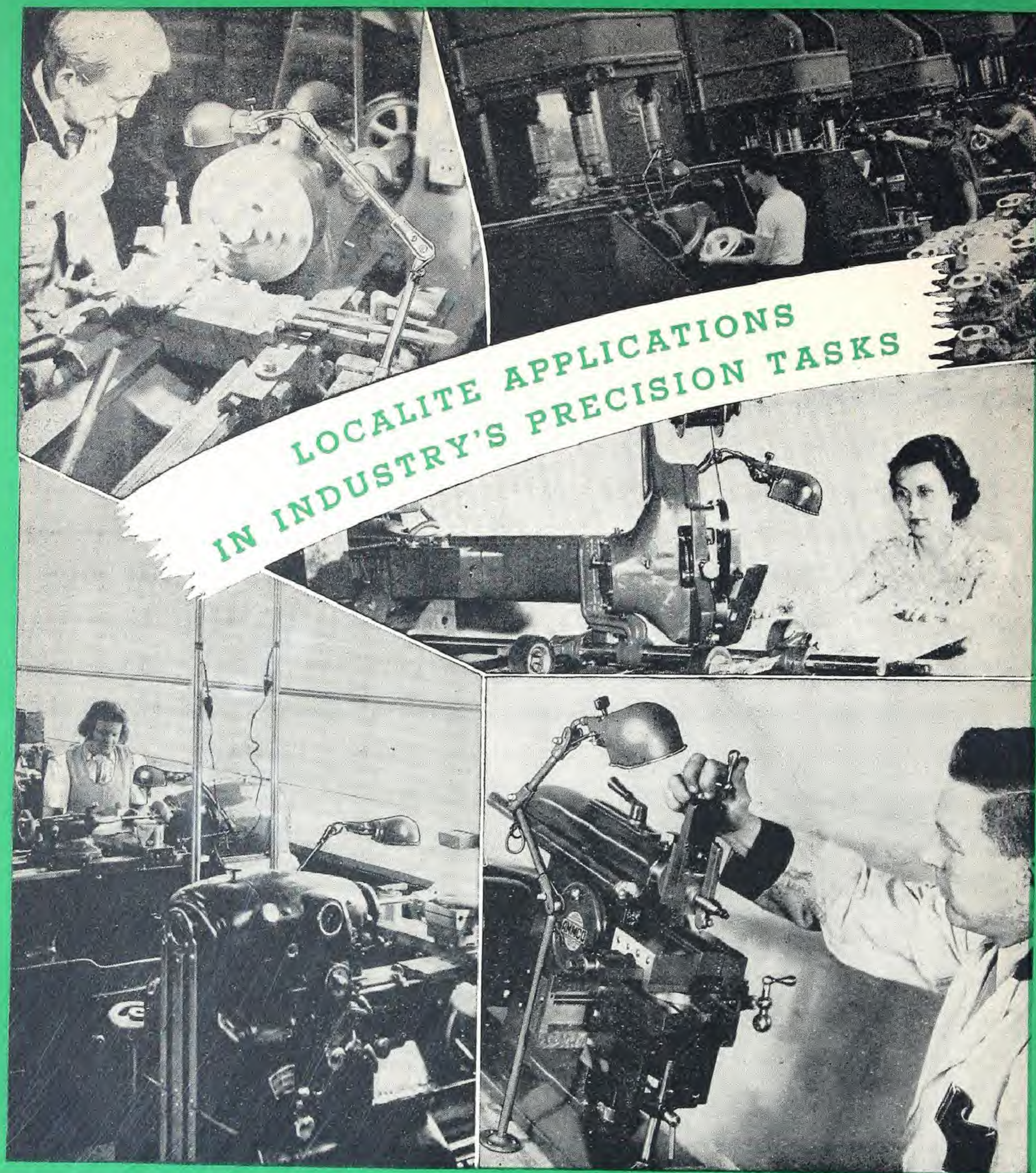
Single Arm Design		Double Arm Design	
No.	Overall Length	No.	Overall Length
32	11"	3267	21"
34	15"	3470	32"

### HOW TO ORDER

Standard Supporting Arms, Reflector Assemblies and Base Attachments carry individual stock numbers. Combinations of these numbers provide stock numbers for complete standard units. For example—complete unit No. 3267-P-102 is a wired combination of No. 3267 Supporting Arm, No. "P" Reflector Assembly and No.

102 Base Attachment. In case a No. "H" Reflector Assembly is desired, instead of No. "P" the stock number to use is No. 3267-H-102. If a Base Attachment different from No. 102 is needed, the number for the desired part is substituted for No. 102.





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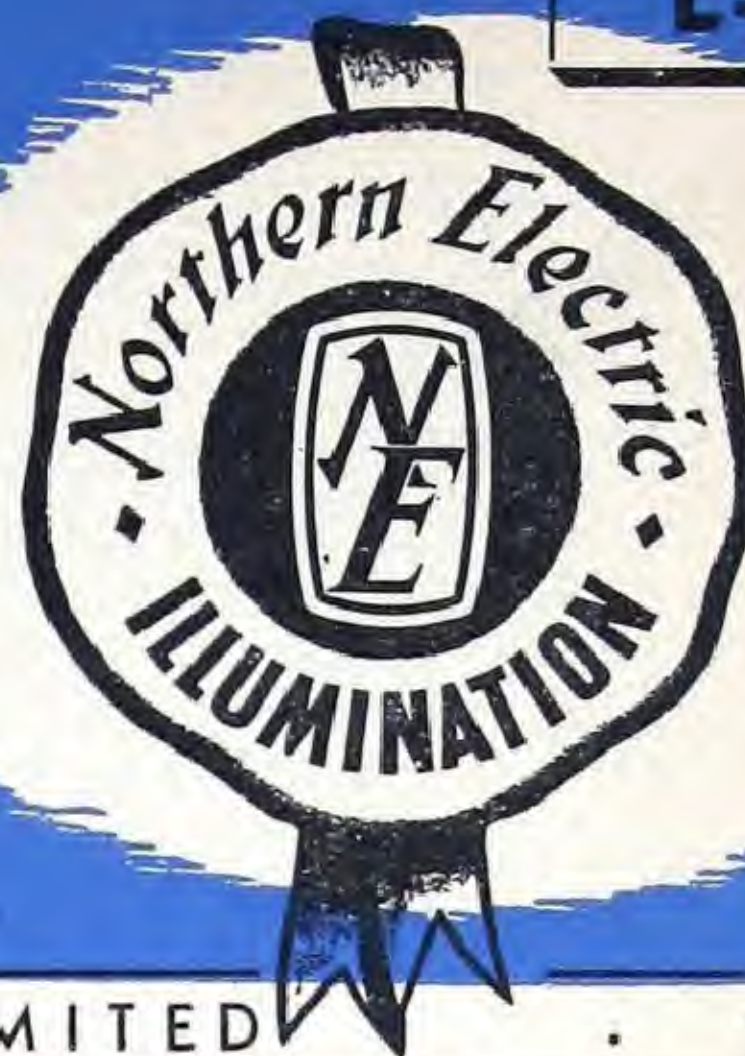
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# Nor-Lectric BULLETIN



ISHED BY NORTHERN ELECTRIC COMPANY LIMITED . 1944

## NEW TRANQUILUX FLUORESCENT LUMINAIRE



No. 6221-C

- |  |                          |
|--|--------------------------|
| 1. FLURACITE REFLECTOR                 | 3. DIFFUSING LAMP SHIELD |
| 2. FLUORESCENT LAMPS<br>(Not Supplied) | 4. LIGHT MIXING SHIELD   |

### SMOOTH—COOL—DAYLIGHT

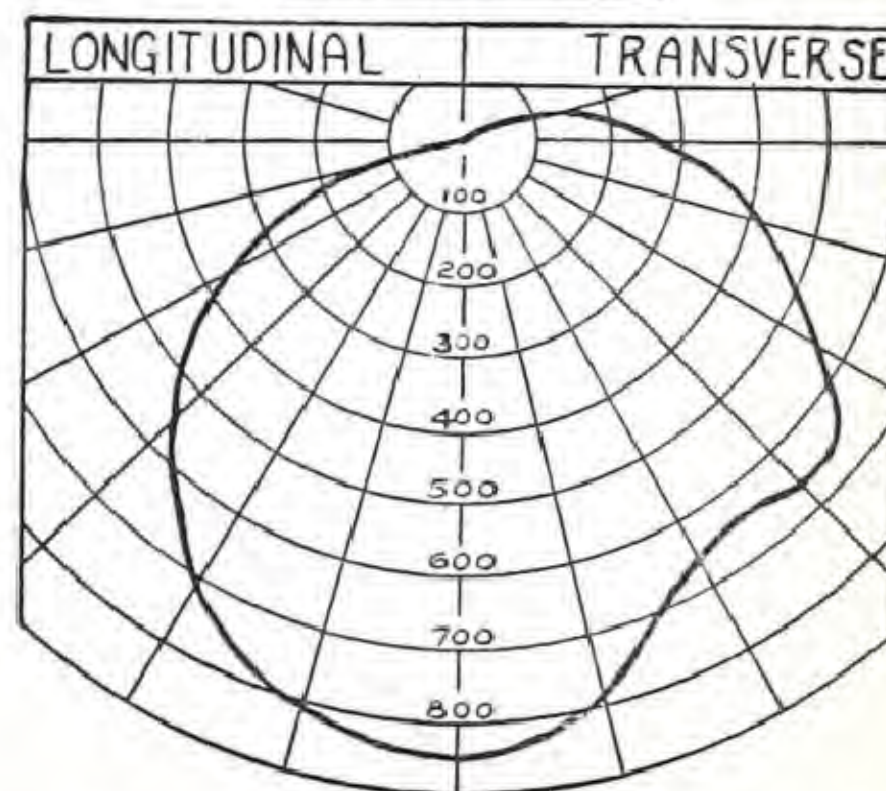
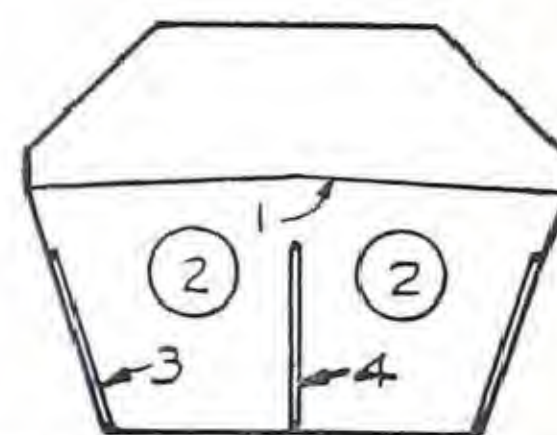
The two lamps operate out-of-step, with one lamp at maximum brilliance when the other is at its minimum. The mixing panel of Tranquilux neutralizes the light from both lamps, giving smooth, even illumination.

### EFFICIENCY

0°-90°—65.8%  
90°-180°—5.2%  
0°-180°—71%

### QUALITY FLUORESCENT LIGHTING SHIELDED LAMPS—WITH EFFICIENCY

The lamps are well shielded from any normal transverse viewing angle. The planes of the reflector and shield are selected to minimize dust collection, thereby maintaining initial efficiency.



**Note:** For best results on 25-cycle circuits, use lamps with coated ends. Where three-phase power is available, connect adjacent units to alternate phases.

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## HOW TO MAKE CONTINUOUS RUNS

Remove ornaments and bolts from end plates to be joined. Couple end plates together with chase nipple and locknut and replace bolts.

## FLURACITE REFLECTING SURFACE

Fluracite on steel. This reflecting surface is a synthetic material, glossy white and mineral-hard, discovered by Curtis after extensive research—especially developed to maintain, and not distort, the colour value of the fluorescent lamp. Fluracite possesses unusually high reflectivity and is easily cleaned with soap and water.

## PLANNING WITH TRANQUILUX FOOTCANDLE CHARTS

Footcandles for Tranquilux may be calculated from the charts or by the "Coefficient of Utilization" method, using the table directly below.

COEFFICIENTS OF UTILIZATION									
CEILING	75%			50%			30%		
WALLS	50%	30%	10%	50%	30%	10%	50%	30%	10%
ROOM INDEX	COEFFICIENTS OF UTILIZATION								
J	.29	.25	.22	.29	.25	.22	.24	.22	
I	.37	.32	.30	.36	.32	.29	.32	.29	
H	.40	.36	.34	.39	.36	.34	.35	.33	
G	.44	.40	.37	.42	.39	.37	.38	.36	
F	.47	.43	.40	.45	.42	.39	.41	.39	
E	.51	.47	.44	.49	.46	.43	.45	.43	
D	.55	.51	.48	.53	.50	.47	.49	.47	
C	.57	.52	.49	.54	.51	.49	.51	.48	
B	.60	.56	.53	.57	.54	.52	.53	.52	
A	.61	.58	.55	.59	.56	.54	.55	.53	

The application of continuous fluorescent sources to general lighting problems is somewhat different from planning for luminaires on conventional outlet spacing. For this reason, the footcandle charts shown have been prepared.

Constant footcandle values are obtained under a continuous section at points more than 12 feet in from either end. At the end of a long section, the values are one-half of those under the centre of a long section.

The chart shows how the intensities under single and continuous sections vary with mounting height. It is easy to determine the intensities between continuous sections by the use of the data given.

The charts have been compiled from tests on units mounted on a fairly light ceiling and are based on lamps of 2100 lumens, which is the present rated lumen output for 40-watt white lamps. All values are for white lamps. For daylight lamps, decrease values by 15 per cent. A maintenance factor of .75 per cent is suggested. This means the footcandle values over a period of time will be 75 per cent of those given in the tables.

## APPROXIMATE FOOTCANDLE VALUES

For large interiors with average ceiling heights, each watt (including ballasts), per square foot of floor area, will produce approximately 15 to 20 footcandles including a depreciation factor. For smaller rooms for each watt per square foot an average of 12 to 15 footcandles will result.

### FOOT-CANDLE READINGS ON HORIZONTAL PLANE

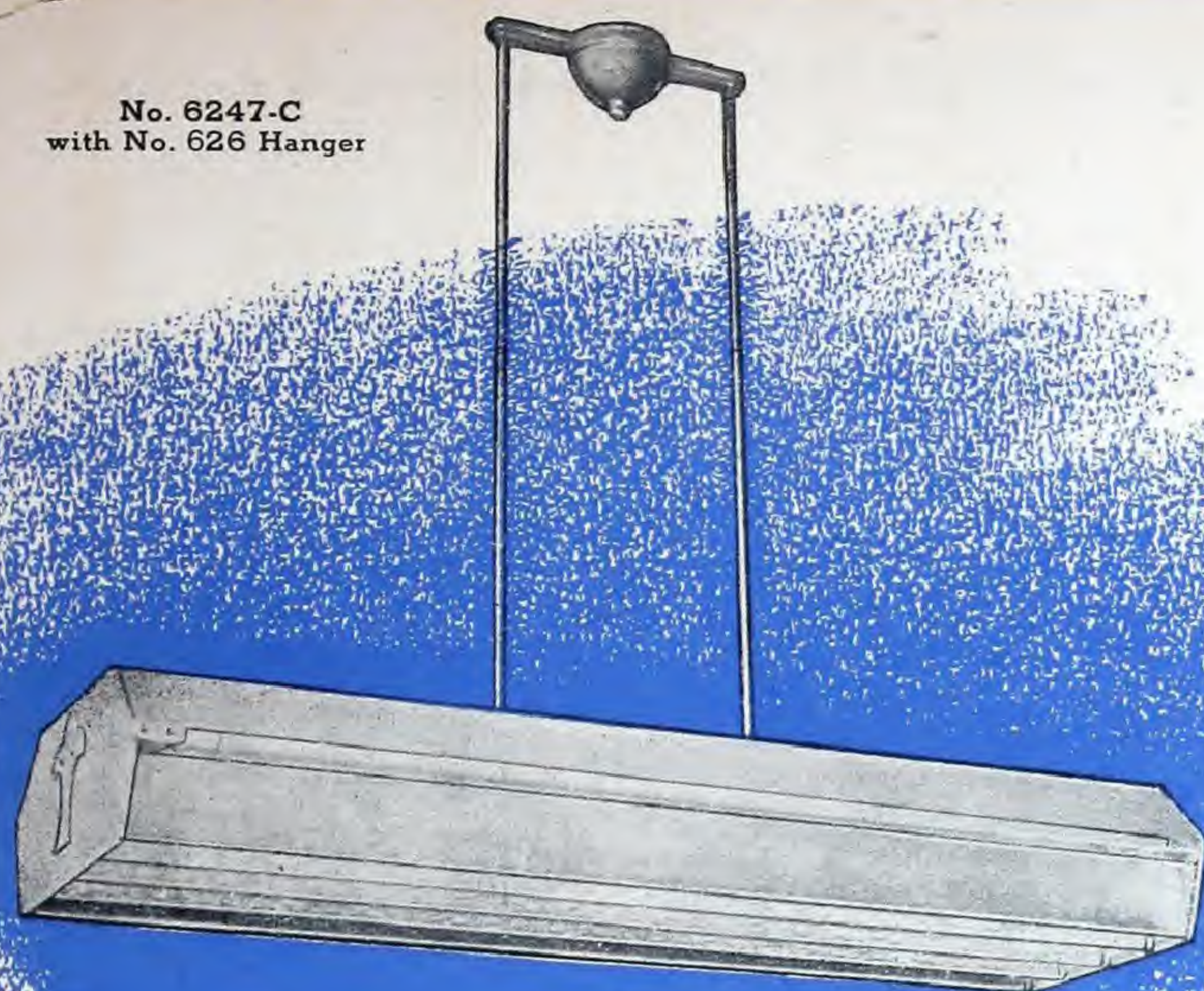
SINGLE TWO LAMP UNIT														
ALSO CONTINUOUS SECTION														
LAMP WATTAGE	READINGS ON CENTRE LINE PARALLEL TO LAMPS							READINGS ON CENTRE LINE RIGHT ANGLES TO LAMPS						
	1	2	3	5	11	18	20	16	9	5.5	3.5	3	2	
2-40														6'
CONT.							60	45	30	17	10	8	4	9'
2-40	2	3	3.5	5	7	9	10	9	6	5	3.5	2.5	2	12'
CONT.							40	36	24	21	14	8	6	
2-40	1	2	3.5	4	7	7	7	7	5	3	2	1		
CONT.							32	26	24	20	14	10	5	
	12'	10'	8'	6'	4'	2'	0'	2'	4'	6'	8'	10'	12'	

SINGLE THREE LAMP UNIT														
ALSO CONTINUOUS SECTION														
LAMP WATTAGE	READINGS ON CENTRE LINE PARALLEL TO LAMPS							READINGS ON CENTRE LINE RIGHT ANGLES TO LAMPS						
	1.5	2.5	4	7	15	26	30	24	13	10	5	3.5	2.5	
3-40														6'
CONT.							90	70	40	30	15	10	5	9'
3-40	2.5	4	5	7	10	13	15	13	9	7	6	3.5	3	12'
CONT.							60	50	36	28	18	10	8	
3-40	1.5	3	5	6	10	10	10	10	7	5	3	1.5		
CONT.							45	40	38	28	22	15	7	
	12'	10'	8'	6'	4'	2'	0'	2'	4'	6'	8'	10'	12'	

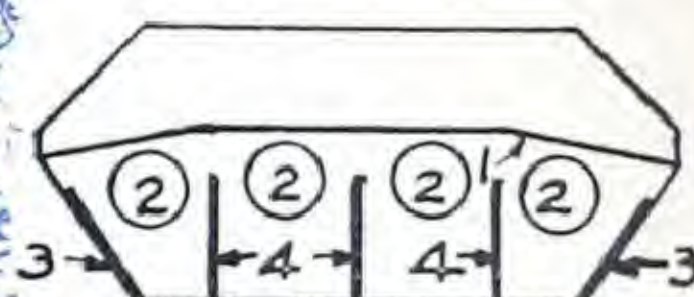
SINGLE FOUR LAMP UNIT														
ALSO CONTINUOUS SECTION														
LAMP WATTAGE	READINGS ON CENTRE LINE PARALLEL TO LAMPS							READINGS ON CENTRE LINE RIGHT ANGLES TO LAMPS						
	2	3	5	9	19	35	40	32	17	14	7	4	3	
4-40														6'
CONT.							120	94	54	42	21	11	6	9'
4-40	3	5	7	9	13	17	20	18	12.5	9.5	8	5	4	12'
CONT.							80	72	50	38	32	20	12	
4-40	2	4	7	8	13	13	13	13	9	7	4	2		
CONT.							58	50	40	35	30	20	10	
	12'	10'	8'	6'	4'	2'	0'	2'	4'	6'	8'	10'	12'	



No. 6247-C  
with No. 626 Hanger



## CURTIS NEW TRANQUILUX FLUORESCENT LUMINAIRE



1. FLURACITE REFLECTOR
2. FLUORESCENT LAMPS  
(Not supplied)
3. DIFFUSING LAMP SHIELD
4. LIGHT MIXING SHIELD

**Smooth and tranquil light** with a minimum of flicker is assured with the new Tranquilux. The patented mixing panel, shape of reflector and other features make this new luminaire particularly good. **Eye comfort lighting** is radiated by this well-shielded unit which increases the area of the light source and conceals the lamps from any normal transverse viewing angle.

**Graceful in design** and fine in appearance, it blends into and enhances modern interiors.

**Efficient and effective light control.** The maximum output is directed toward horizontal sur-

faces with adequate emission toward vertical planes to make the seeing task on slanted or vertical surfaces easy.

**Ease of maintenance** is assured by the placing of all reflecting and diffusing elements in planes which resist dust adhesion. All of these important surfaces are easy to clean and, being hard, they resist scratching or deterioration.

**Economical to install**, as all units can be mounted in continuous rows which lowers wiring costs. In many cases, individual four-lamp units on existing outlets will give adequate illumination without re-wiring.

Number of 40-Watt Lamps	DIMENSIONS		CATALOGUE NUMBERS	
	Height	Width	60-Cycle	25-Cycle
Two.....	7"	9"	6227-C	6227-F
Three.....	7"	12 1/4"	6237-C	Not available
Four.....	7"	16"	6247-C	6247-F

Hangers not included.



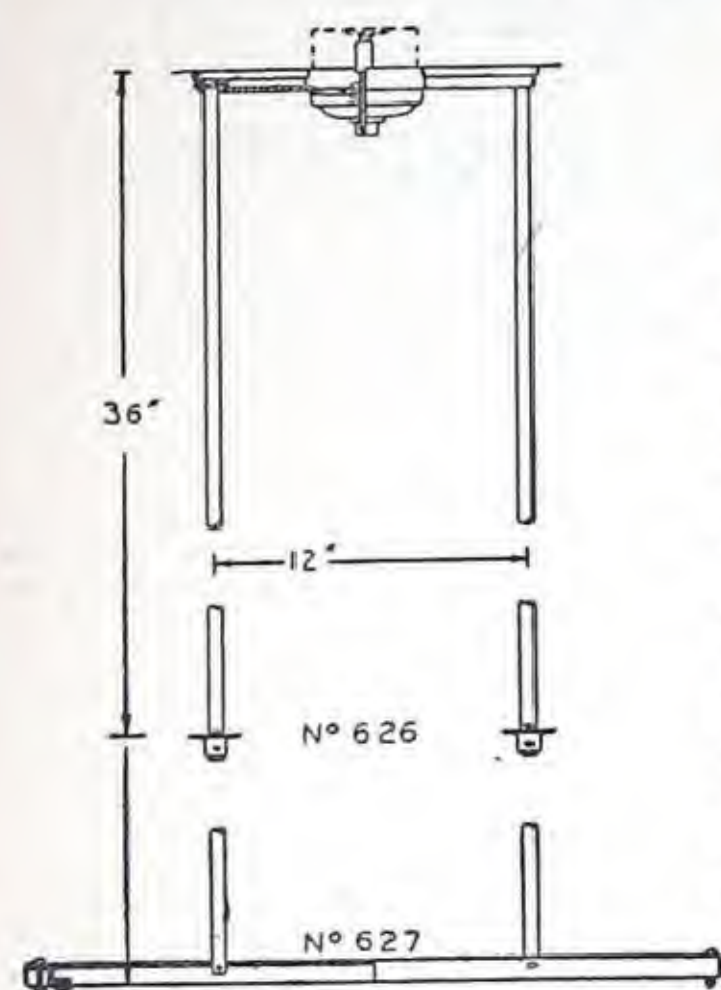
## HANGERS FOR SUSPENDING TRANQUILUX

FINISH: Aluminum Lacquered

For normal ceiling heights (11' 6" and lower) mount Tranquilux units directly against ceiling. On higher ceilings, they may be suspended if desired. For good appearance and lighting results, the top of the housing should be from 10' to 11' above the floor.

### TWO-STEM HANGERS

Catalogue Nos. 626-627



These hangers consist of a cast canopy bar and two steel tube stems. Stems are held at top and bottom by heavy cotter pins. Standard suspension is 36" from ceiling to top of Tranquilux which can be shortened easily on the job by cutting off stems to new length and drilling  $\frac{1}{4}$ " hole in each stem. Use No. 626 hanger for Nos. 6227-C, 6247-C and 6247-F when hanger is at centre of unit or on all units when hanger is over junction between two units. Use No. 627 hanger for Nos. 6227-F and 6237-C.

### ONE-STEM HANGER

Catalogue No. 624

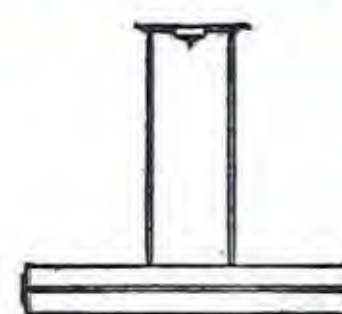


This hanger is composed of a single steel stem with a self-aligning canopy fitting. The lower end is threaded, and a locknut, two heavy washers and clamping nut are included. A knockout in the top of the Tranquilux is provided for fastening to stem.

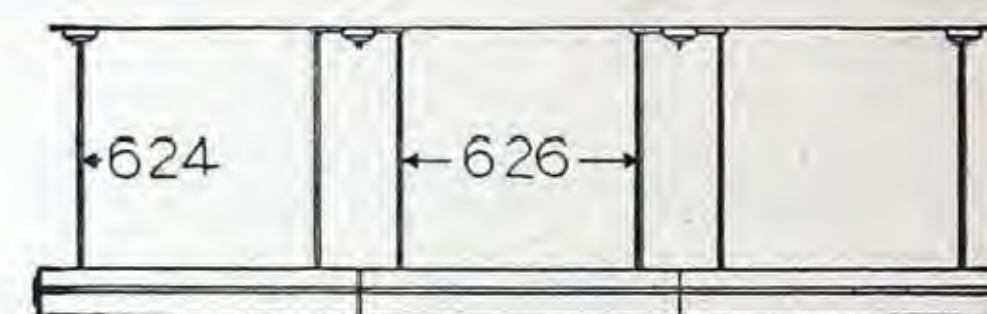
## SUGGESTED HANGER PLANS



Four (Even Numbered) Sections



One Section

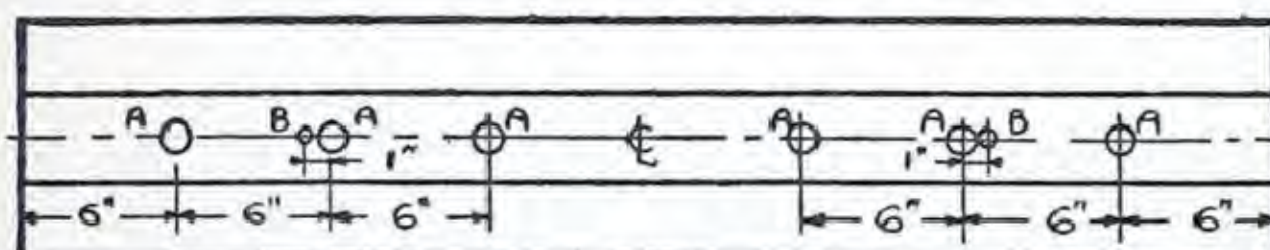


Three (Odd Numbered) Sections

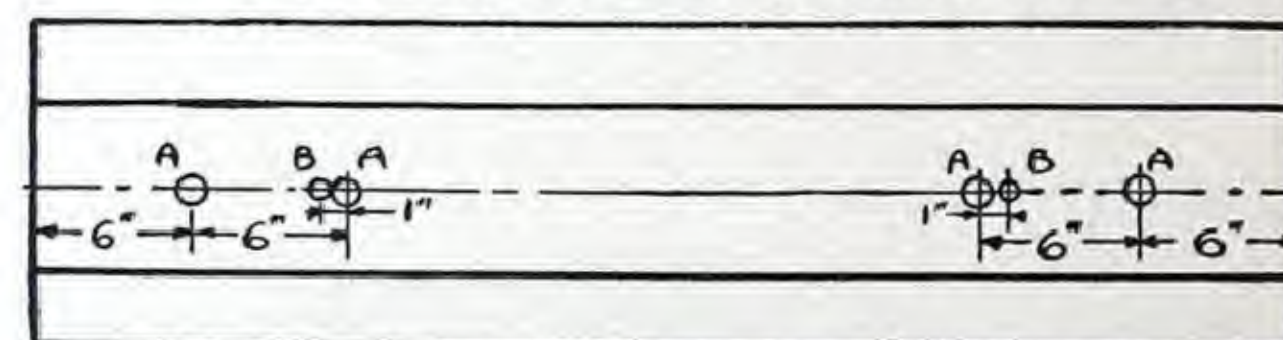
### KNOCKOUTS AND SUPPORTS

Knockouts are provided in the top of all Tranquilux units for use as wire entrance or for attachment to hangers. Quarter-inch holes ("B") are used for toggle or expansion bolts when units are mounted directly on the ceiling. "A" indicates location of knockouts for hangers.

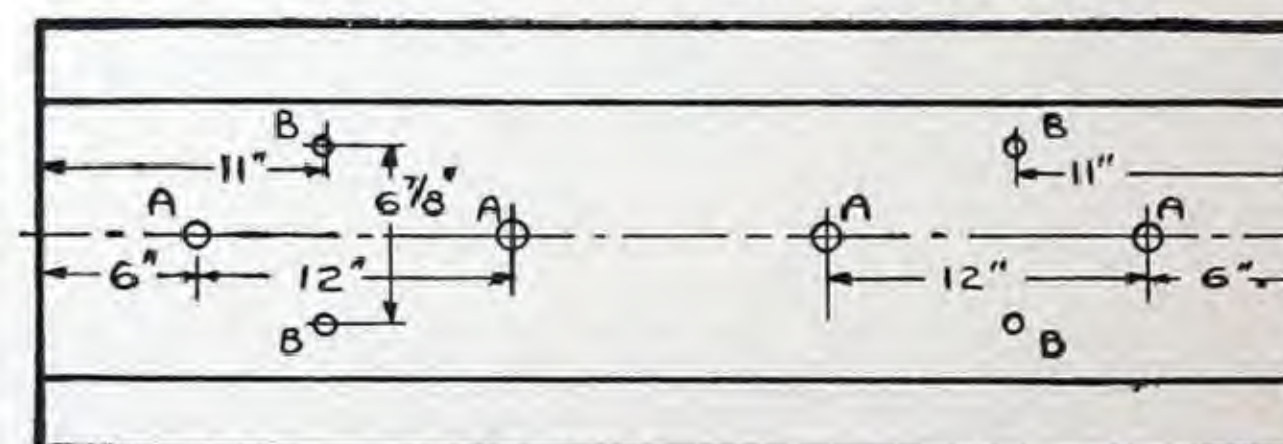
No. 6227. Two-Lamp Tranquilux



No. 6237. Three-Lamp Tranquilux



No. 6247. Four-Lamp Tranquilux



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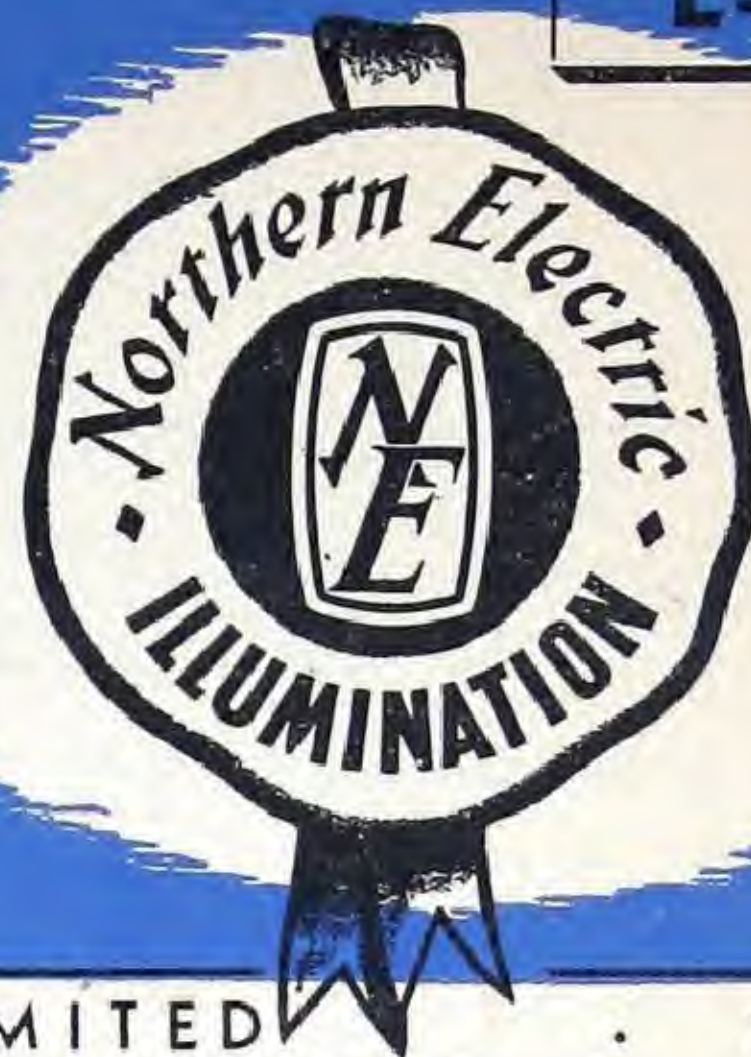
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# Nor-Lectric BULLETIN

July 1944

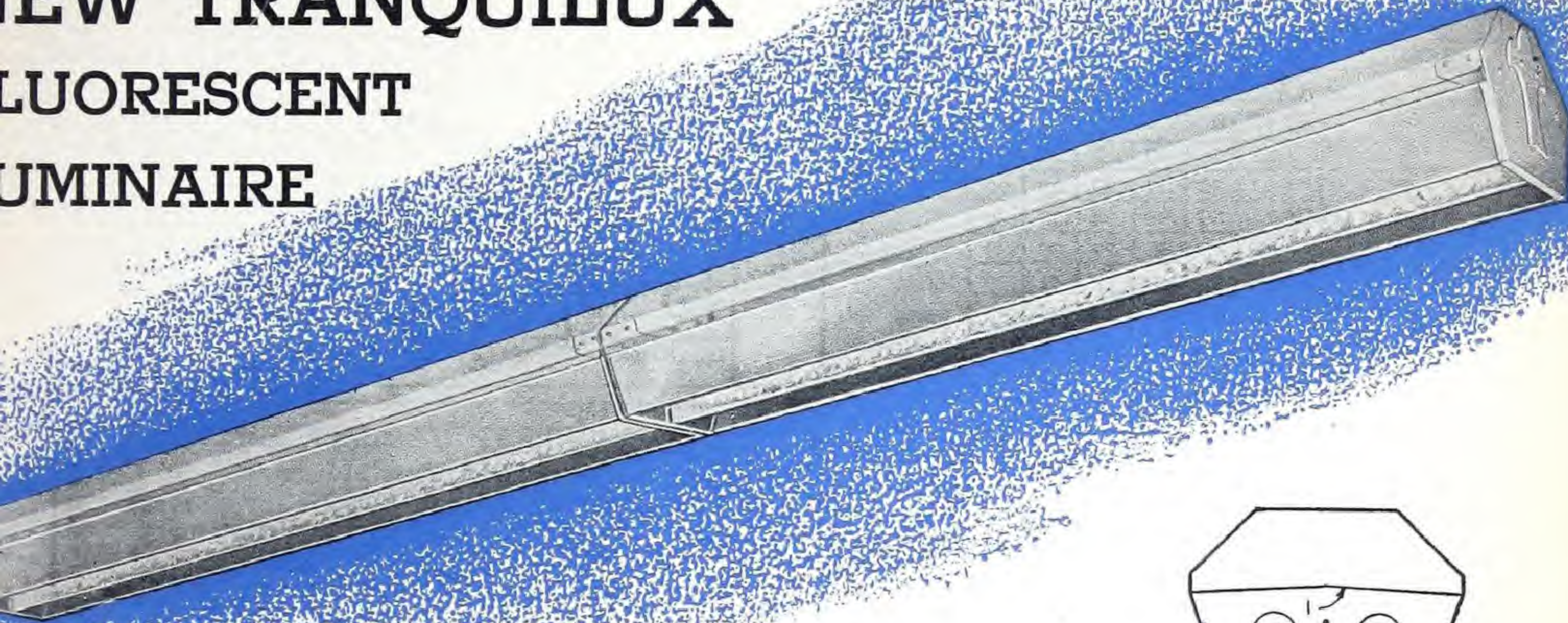
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1944

## NEW TRANQUILUX FLUORESCENT LUMINAIRE



No. 6221-C

- |  |                          |
|--|--------------------------|
| 1. FLURACITE REFLECTOR                 | 3. DIFFUSING LAMP SHIELD |
| 2. FLUORESCENT LAMPS<br>(Not Supplied) | 4. LIGHT MIXING SHIELD   |

### SMOOTH—COOL—DAYLIGHT

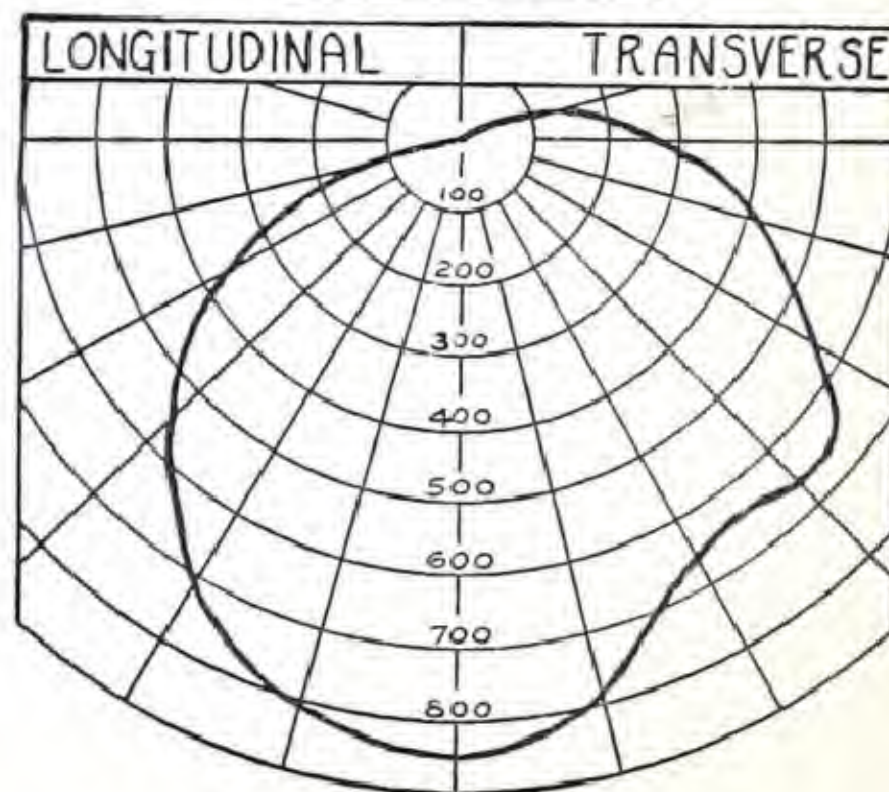
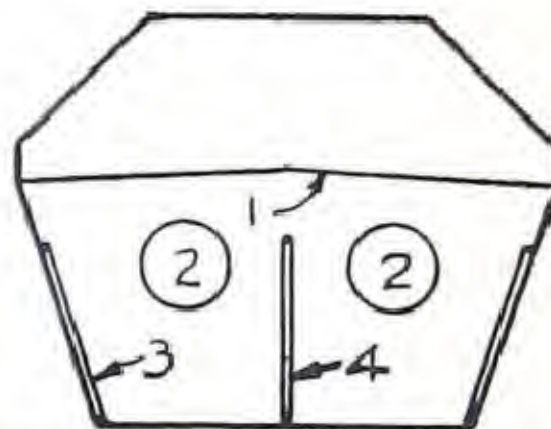
The two lamps operate out-of-step, with one lamp at maximum brilliance when the other is at its minimum. The mixing panel of Tranquilux neutralizes the light from both lamps, giving smooth, even illumination.

### EFFICIENCY

0°-90°—65.8%  
90°-180°—5.2%  
0°-180°—71%

### QUALITY FLUORESCENT LIGHTING SHIELDED LAMPS—WITH EFFICIENCY

The lamps are well shielded from any normal transverse viewing angle. The planes of the reflector and shield are selected to minimize dust collection, thereby maintaining initial efficiency.



**Note:** For best results on 25-cycle circuits, use lamps with coated ends. Where three-phase power is available, connect adjacent units to alternate phases.

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TROIS RIVIERES	TORONTO	KIRKLAND LAKE	REGINA	VANCOUVER
SHERBROOKE		TUMMINS		VICTORIA

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## HOW TO MAKE CONTINUOUS RUNS

Remove ornaments and bolts from end plates to be joined. Couple end plates together with chase nipple and locknut and replace bolts.

## FLURACITE REFLECTING SURFACE

Fluracite on steel. This reflecting surface is a synthetic material, glossy white and mineral-hard, discovered by Curtis after extensive research—especially developed to maintain, and not distort, the colour value of the fluorescent lamp. Fluracite possesses unusually high reflectivity and is easily cleaned with soap and water.

## PLANNING WITH TRANQUILUX FOOTCANDLE CHARTS

Footcandles for Tranquilux may be calculated from the charts or by the "Coefficient of Utilization" method, using the table directly below.

COEFFICIENTS OF UTILIZATION									
CEILING	75%			50%			30%		
WALLS	50%	30%	10%	50%	30%	10%	50%	30%	10%
ROOM INDEX	COEFFICIENTS OF UTILIZATION								
J	.29	.25	.22	.29	.25	.22	.24	.22	
I	.37	.32	.30	.36	.32	.29	.32	.29	
H	.40	.36	.34	.39	.36	.34	.35	.33	
G	.44	.40	.37	.42	.39	.37	.38	.36	
F	.47	.43	.40	.45	.42	.39	.41	.39	
E	.51	.47	.44	.49	.46	.43	.45	.43	
D	.55	.51	.48	.53	.50	.47	.49	.47	
C	.57	.52	.49	.54	.51	.49	.51	.48	
B	.60	.56	.53	.57	.54	.52	.53	.52	
A	.61	.58	.55	.59	.56	.54	.55	.53	

The application of continuous fluorescent sources to general lighting problems is somewhat different from planning for luminaires on conventional outlet spacing. For this reason, the footcandle charts shown have been prepared.

Constant footcandle values are obtained under a continuous section at points more than 12 feet in from either end. At the end of a long section, the values are one-half of those under the centre of a long section.

The chart shows how the intensities under single and continuous sections vary with mounting height. It is easy to determine the intensities between continuous sections by the use of the data given.

The charts have been compiled from tests on units mounted on a fairly light ceiling and are based on lamps of 2100 lumens, which is the present rated lumen output for 40-watt white lamps. All values are for white lamps. For daylight lamps, decrease values by 15 per cent. A maintenance factor of 75 per cent is suggested. This means the footcandle values over a period of time will be 75 per cent of those given in the tables.

## APPROXIMATE FOOTCANDLE VALUES

For large interiors with average ceiling heights, each watt (including ballasts), per square foot of floor area, will produce approximately 15 to 20 footcandles including a depreciation factor. For smaller rooms for each watt per square foot an average of 12 to 15 footcandles will result.

### FOOT-CANDLE READINGS ON HORIZONTAL PLANE

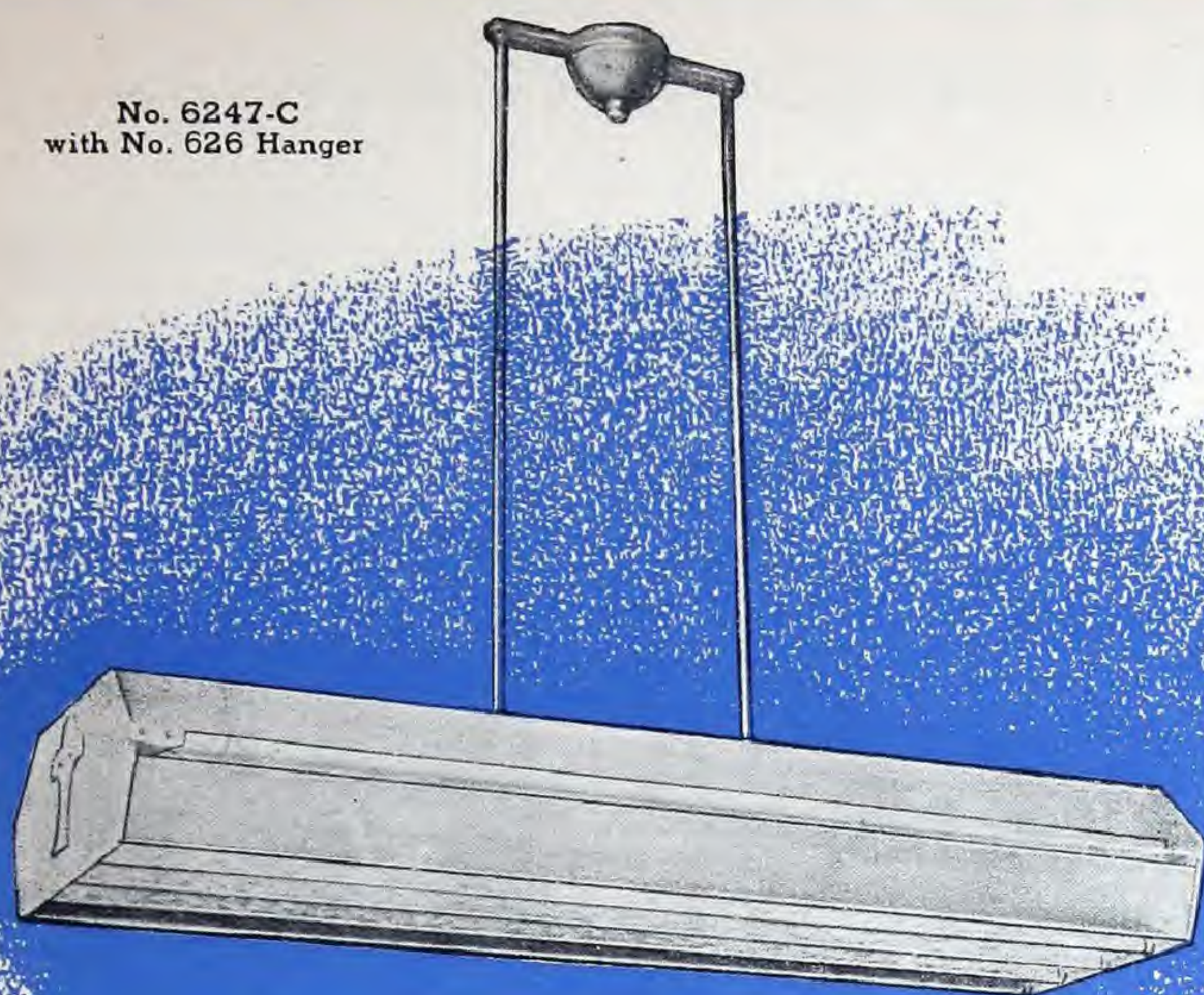
SINGLE TWO LAMP UNIT													
ALSO CONTINUOUS SECTION													
LAMP WATTAGE	READINGS ON CENTRE LINE PARALLEL TO LAMPS							READINGS ON CENTRE LINE RIGHT ANGLES TO LAMPS					
	1	2	3	5	11	18	20	16	9	5.5	3.5	3	2
2-40													
CONT.							60	45	30	17	10	8	4
2-40	2	3	3.5	5	7	9	10	9	6	5	3.5	2.5	2
CONT.							40	36	24	21	14	8	6
2-40	1	2	3.5	4	7	7	7	7	5	3	2	1	
CONT.							32	26	24	20	14	10	5
	12'	10'	8'	6'	4'	2'	0'	2'	4'	6'	8'	10'	12'

SINGLE THREE LAMP UNIT													
ALSO CONTINUOUS SECTION													
LAMP WATTAGE	READINGS ON CENTRE LINE PARALLEL TO LAMPS							READINGS ON CENTRE LINE RIGHT ANGLES TO LAMPS					
	1.5	2.5	4	7	15	26	30	24	13	10	5	3.5	2.5
3-40													
CONT.							90	70	40	30	15	10	5
3-40	2.5	4	5	7	10	13	15	13	9	7	6	3.5	3
CONT.							60	50	36	28	18	10	8
3-40	1.5	3	5	6	10	10	10	10	7	5	3	1.5	
CONT.							45	40	38	28	22	15	7
	12'	10'	8'	6'	4'	2'	0'	2'	4'	6'	8'	10'	12'

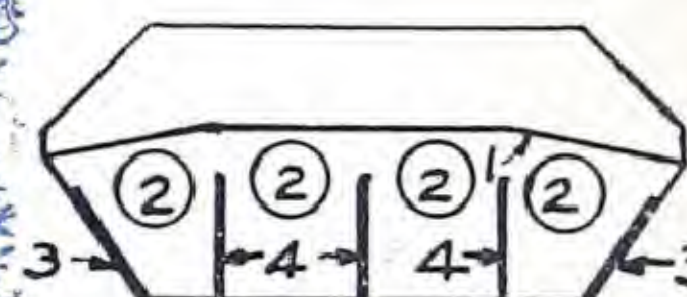
SINGLE FOUR LAMP UNIT													
ALSO CONTINUOUS SECTION													
LAMP WATTAGE	READINGS ON CENTRE LINE PARALLEL TO LAMPS							READINGS ON CENTRE LINE RIGHT ANGLES TO LAMPS					
	2	3	5	9	19	35	40	32	17	14	7	4	3
4-40													
CONT.							120	94	54	42	21	11	6
4-40	3	5	7	9	13	17	20	18	12.5	9.5	8	5	4
CONT.							80	72	50	38	32	20	12
4-40	2	4	7	8	13	13	13	13	9	7	4	2	
CONT.							58	50	40	35	30	20	10
	12'	10'	8'	6'	4'	2'	0'	2'	4'	6'	8'	10'	12'



No. 6247-C  
with No. 626 Hanger



## CURTIS NEW TRANQUILUX FLUORESCENT LUMINAIRE



1. FLURACITE REFLECTOR
2. FLUORESCENT LAMPS  
(Not supplied)
3. DIFFUSING LAMP SHIELD
4. LIGHT MIXING SHIELD

**Smooth and tranquil light** with a minimum of flicker is assured with the new Tranquilux. The patented mixing panel, shape of reflector and other features make this new luminaire particularly good.

**Eye comfort lighting** is radiated by this well-shielded unit which increases the area of the light source and conceals the lamps from any normal transverse viewing angle.

**Graceful in design** and fine in appearance, it blends into and enhances modern interiors.

**Efficient and effective light control.** The maximum output is directed toward horizontal sur-

faces with adequate emission toward vertical planes to make the seeing task on slanted or vertical surfaces easy.

**Ease of maintenance** is assured by the placing of all reflecting and diffusing elements in planes which resist dust adhesion. All of these important surfaces are easy to clean and, being hard, they resist scratching or deterioration.

**Economical to install**, as all units can be mounted in continuous rows which lowers wiring costs. In many cases, individual four-lamp units on existing outlets will give adequate illumination without re-wiring.

Number of 40-Watt Lamps	DIMENSIONS		CATALOGUE NUMBERS	
	Height	Width	60-Cycle	25-Cycle
Two.....	7"	9"	6227-C	6227-F
Three.....	7"	12¼"	6237-C	Not available
Four.....	7"	16"	6247-C	6247-F

Hangers not included.



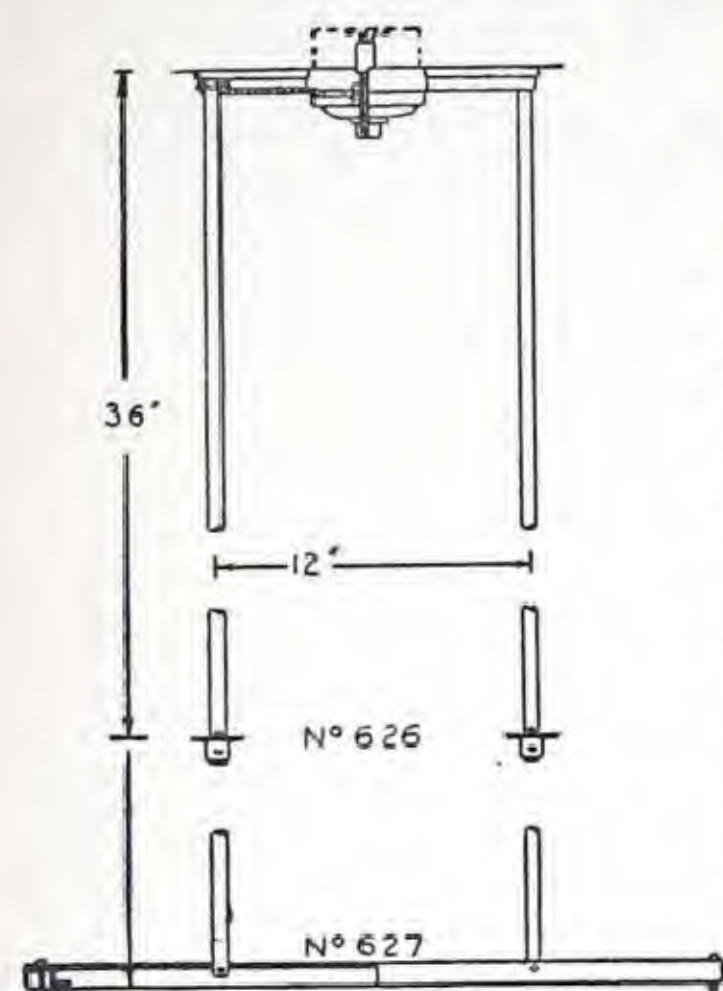
## HANGERS FOR SUSPENDING TRANQUILUX

FINISH: Aluminum Lacquered

For normal ceiling heights (11' 6" and lower) mount Tranquilux units directly against ceiling. On higher ceilings, they may be suspended if desired. For good appearance and lighting results, the top of the housing should be from 10' to 11' above the floor.

### TWO-STEM HANGERS

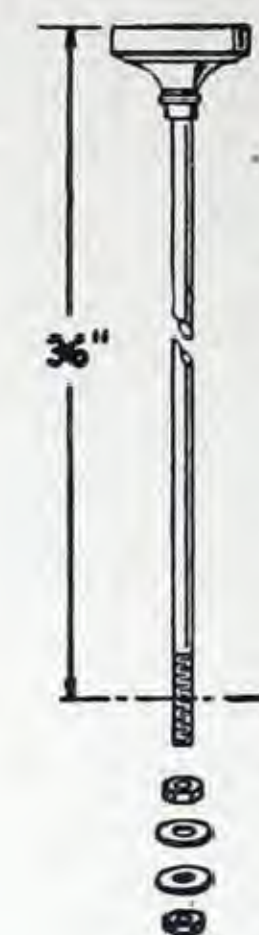
Catalogue Nos. 626-627



These hangers consist of a cast canopy bar and two steel tube stems. Stems are held at top and bottom by heavy cotter pins. Standard suspension is 36" from ceiling to top of Tranquilux which can be shortened easily on the job by cutting off stems to new length and drilling  $\frac{1}{4}$ " hole in each stem. Use No. 626 hanger for Nos. 6227-C, 6247-C and 6247-F when hanger is at centre of unit or on all units when hanger is over junction between two units. Use No. 627 hanger for Nos. 6227-F and 6237-C.

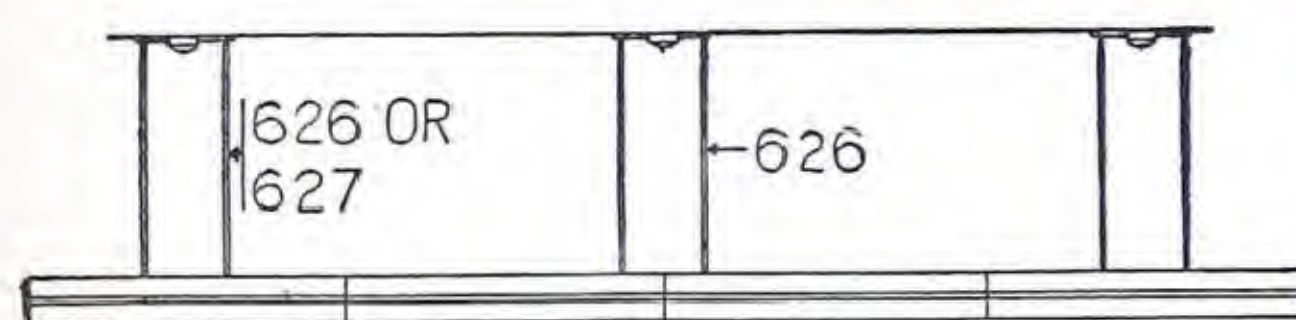
### ONE-STEM HANGER

Catalogue No. 624

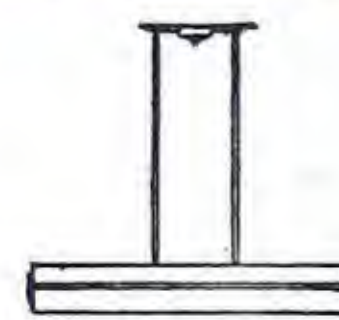


This hanger is composed of a single steel stem with a self-aligning canopy fitting. The lower end is threaded, and a locknut, two heavy washers and clamping nut are included. A knockout in the top of the Tranquilux is provided for fastening to stem.

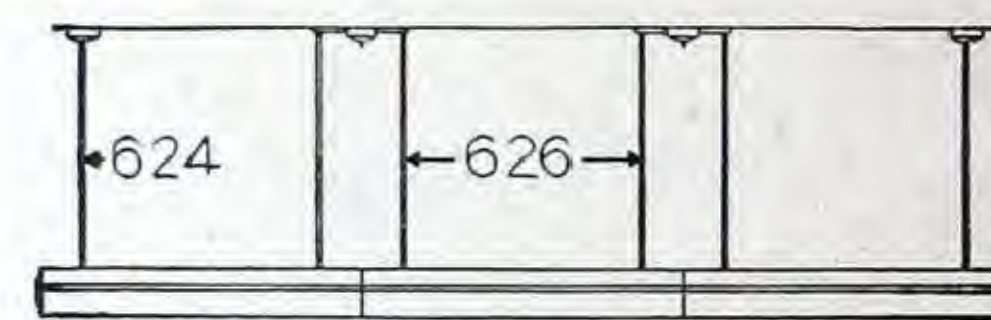
## SUGGESTED HANGER PLANS



Four (Even Numbered) Sections



One Section

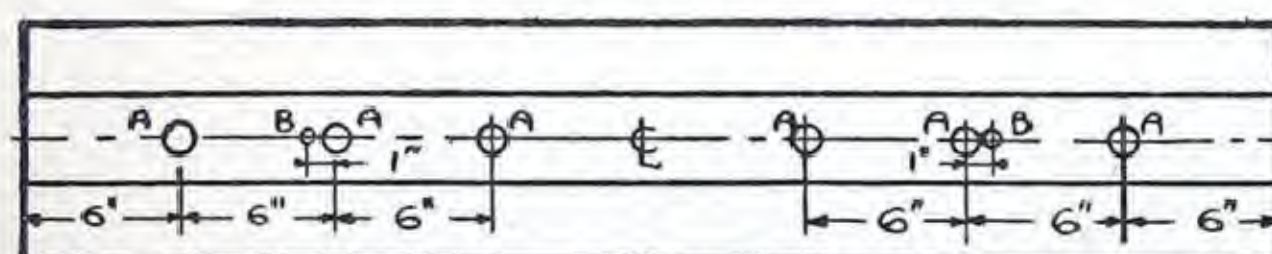


Three (Odd Numbered) Sections

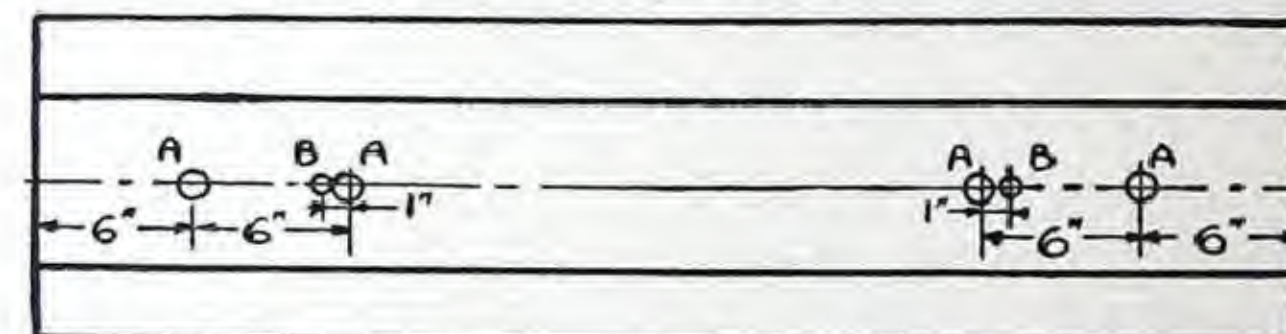
### KNOCKOUTS AND SUPPORTS

Knockouts are provided in the top of all Tranquilux units for use as wire entrance or for attachment to hangers. Quarter-inch holes ("B") are used for toggle or expansion bolts when units are mounted directly on the ceiling. "A" indicates location of knockouts for hangers.

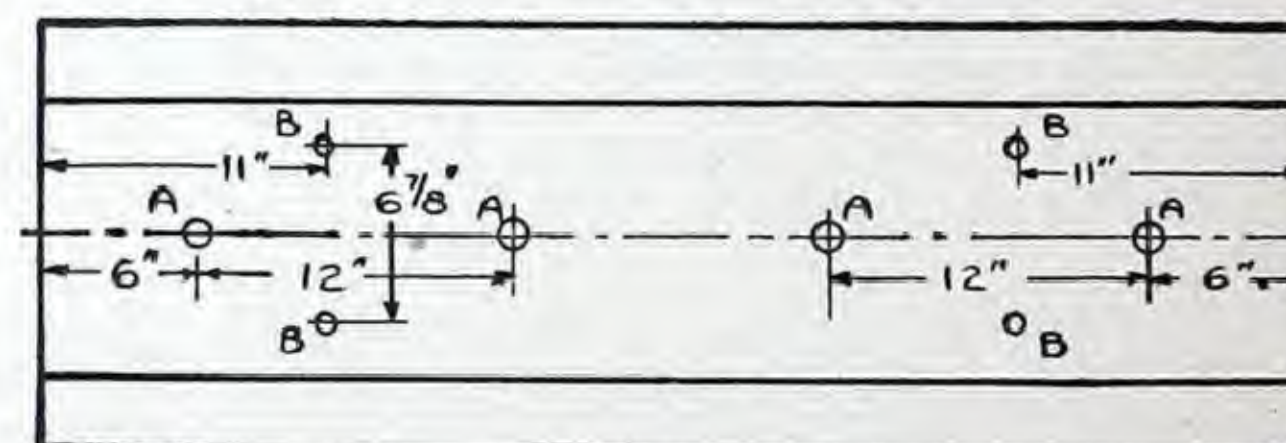
No. 6227. Two-Lamp Tranquilux



No. 6237. Three-Lamp Tranquilux



No. 6247. Four-Lamp Tranquilux



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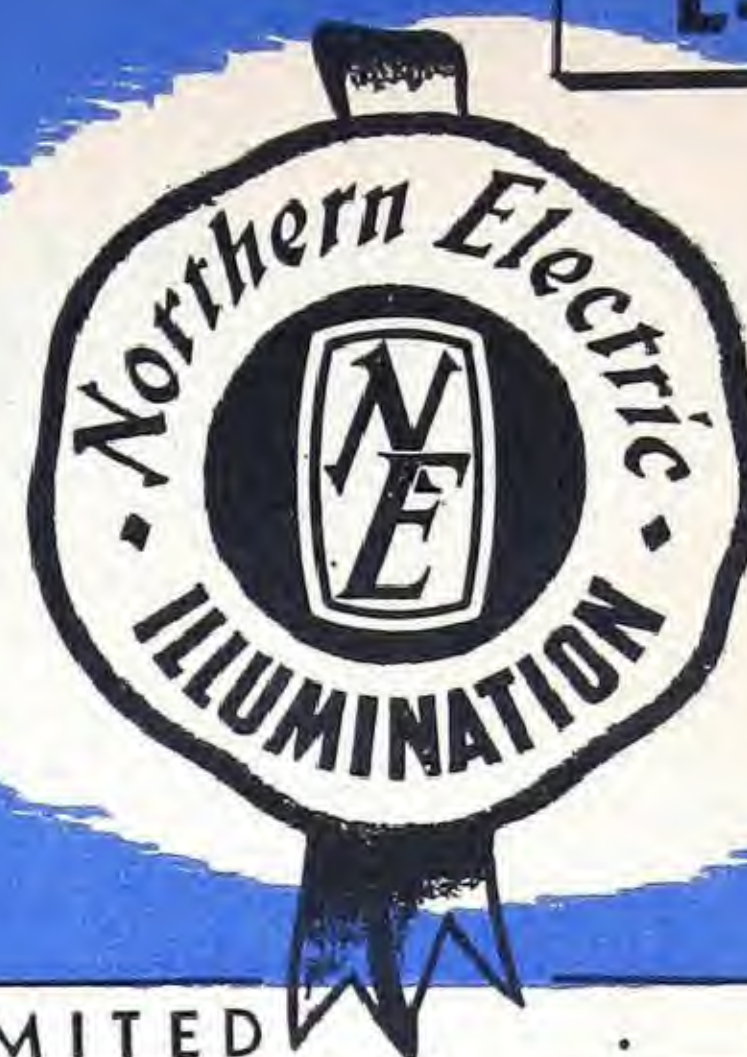
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# Nor-Lectric BULLETIN

August 1944

L-4-4



ISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

## COMMERCIAL LIGHTING FLUORESCENT LUMINAIRES



No. 90340-G

Cat. No.	Lamps	Length	Width	Depth
90240-G	2 x 40	48 1/2"	13"	7"
90340-G	3 x 40	48 1/2"	14"	7"
90440-G	4 x 40	48 1/2"	14"	7"

An attractively priced line of Fluorescent Fixtures. The metal work is of adequate strength and rigidity. Reflecting surfaces are of high-grade baked white enamel. Ballasts, starters and sockets are of the best quality. Glass on the shielded fixture may be sand blasted flat panels or clear ribbed panels as desired. End plates and hangers are finished in silvertone.

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## Fluorescent Luminaires



Cat. No.	Lamps	Length	Width	Depth
90240	2 x 40	49"	9 1/4"	5"
90340	3 x 40	49"	12 1/4"	5 1/2"
90440	4 x 40	49"	14"	7"



Cat. No.	Lamps	Length	Width	Depth
41240	2 x 40	48 1/2"	8 1/2"	4"
41340	3 x 40	48 1/2"	8 1/2"	4 3/4"
41440	4 x 40	48 1/2"	12"	5"

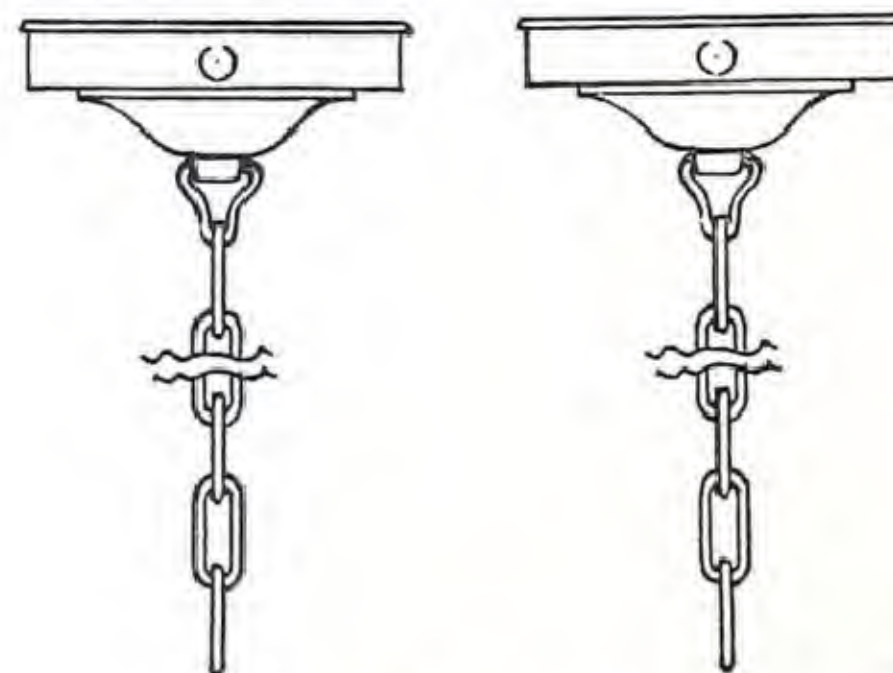


Cat. No.	Lamps	Length	Width	Depth
717140	1 x 40	48"	4 1/2"	1 3/4"
717240	2 x 40	48"	7 1/2"	2 5/8"
717340	3 x 40	48"	8 1/2"	2 5/8"

All fixtures can be supplied with rod hangers, chain hangers, or for mounting on the ceiling without hangers. Specify mounting required when ordering.



Rod Hanger



Two Canopy Chain Hanger



Single Canopy Chain Hanger

Purchasers of fluorescent fixtures are cautioned to acquaint themselves with the order of the War-time Prices and Trade Board. Fluorescent fixtures may be installed only in areas as specified in the order.

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OR-ELECTRIC



BULLETIN

# MIDAS LUMINAIRES



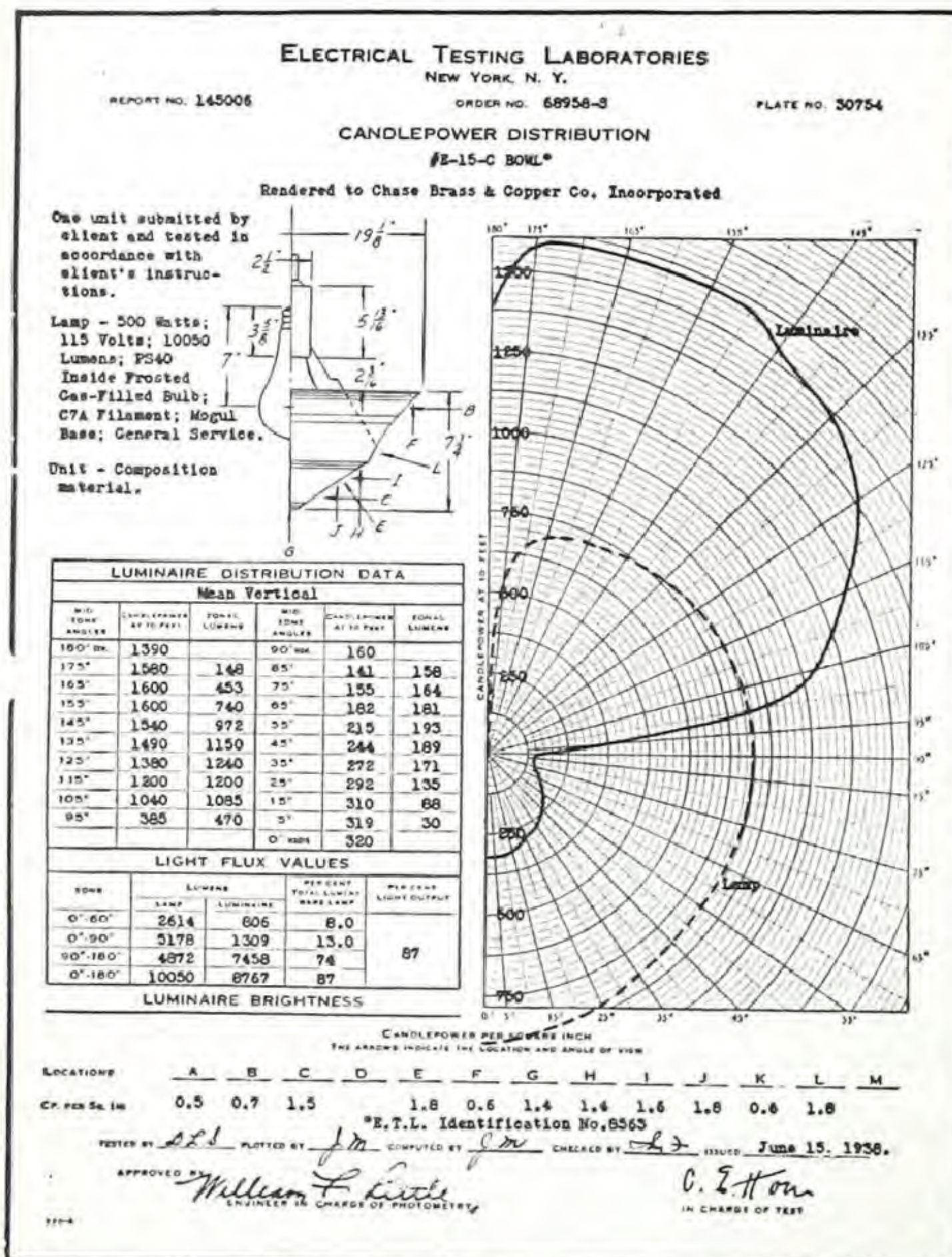
LIGHTING FOR  
CLASSROOMS AND OFFICES



# THE Midas SEMI-INDIRECT

## Luminaires with Plastic Bowls

Due to the principles of design and the efficiency of the plastic employed, these units have a light output efficiency of 86% combined with a pleasing, soft, sunny light. The surface of the plastic bowl has no dark rings or spots to mar its uniform illumination and the surface brightness is such as to allow the fixture to blend harmoniously with the ceiling.



The Midas Plastic Luminaires are guaranteed against warping and discoloration and absorption of moisture.

Catalogue Number Etched Aluminum Hanger	Lamp Watts	Dimensions		Standard Package	Shipping Weight Standard Package
		Length Overall	Bowl Diameter		
1544	200-250	14 1/2"	16"	1	5 1/2 lbs
1546	200-250	28"	16"	1	5 1/2 "
1547	60-100	11 3/8"	10 1/2"	1	4 1/2 "
†1549	300-500	33 1/2"	19"	1	8 "

†The above unit can be supplied with bowl supporting rods which are formed to support a lamp shield.

Shown at left is a light distribution curve illustrating the high efficiency typical of the "Midas" line.

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# *Nor-Lectric* BULLETIN

October 1944

L-5-3



PUBLISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

## MIDAS LUMINAIRES



### *Northern Electric*

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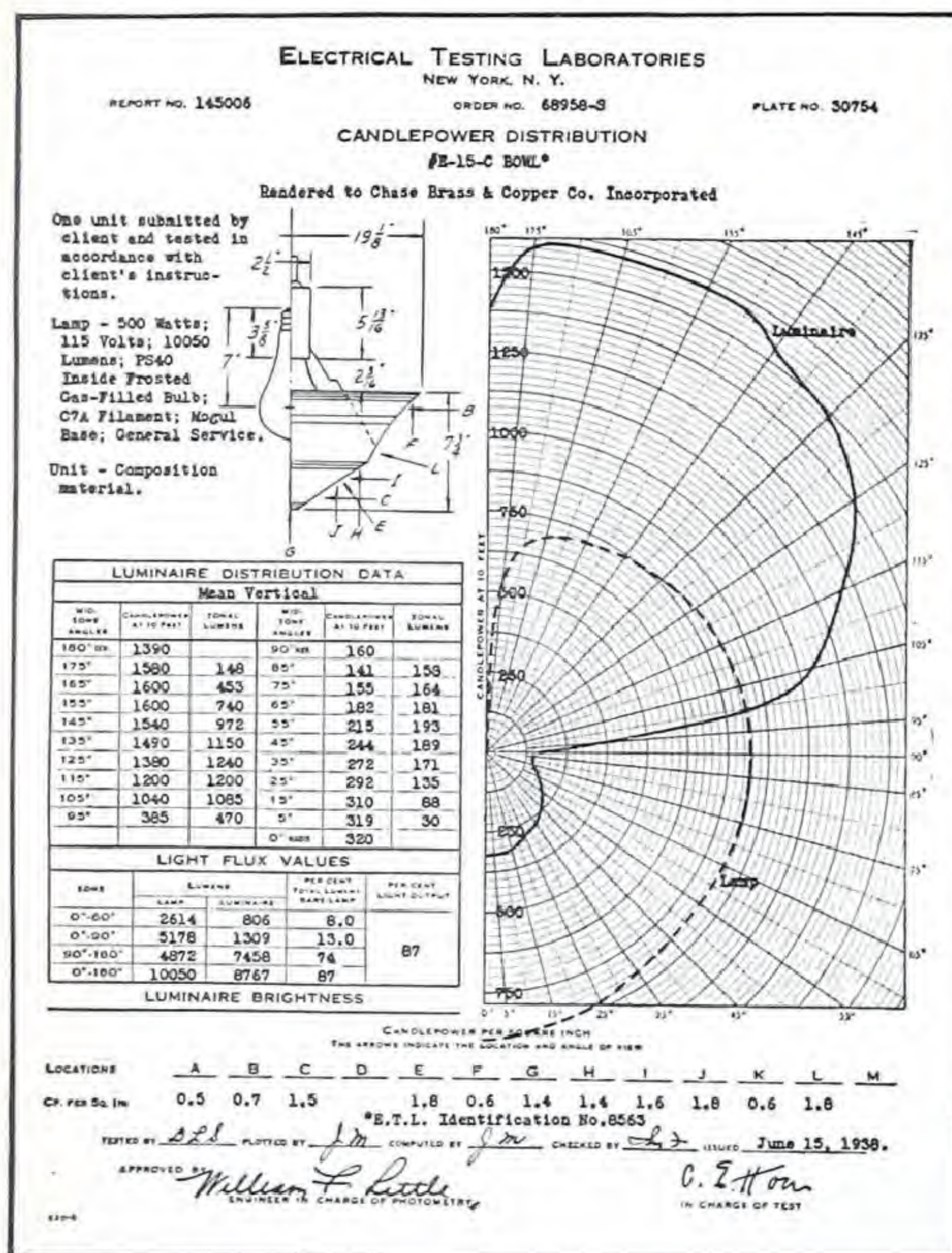
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Catalogue Number Etched Aluminum Hanger	Lamp Watts	Dimensions		Standard Package	Shipping Weight Standard Package
		Length Overall	Bowl Diameter		
*1543	750-1000	46 1/2"	23"	1	10 1/2 lb
†1549	300-500	33 1/2"	19"	1	8 lb

\*Lamp shields supplied with these units.

†The above unit can be supplied with bowl supporting rods which are formed to support a lamp shield.

Shown at left is a light distribution curve illustrating the high efficiency typical of the "Midas" line.

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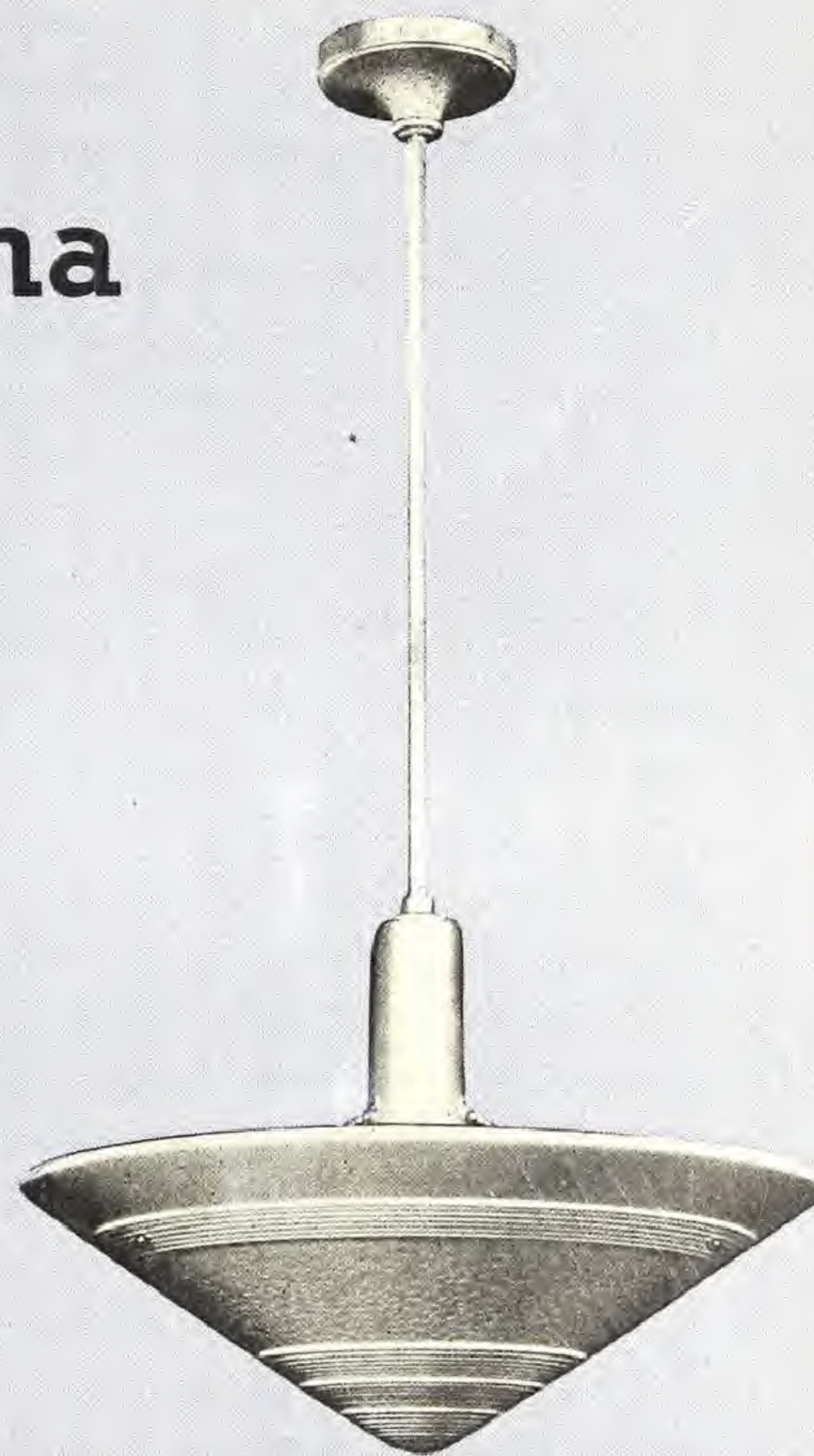


BULLETIN

# The Ainsworth Magna Luminaire

WITH CONICAL  
GRADED-GLASS  
BOWLS

*Incandescent  
Lighting  
At Its Best*



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# **AINSWORTH MAGNA UNITS**



Cat. No. 1645

This unit has been designed to overcome difficulties that were formerly inherent in Incandescent Indirect Lighting. Uniform brightness over the entire depth of the bowl has been achieved by having the glass thickness gradually increased from the outer edge to the apex.

The brightness of the whole unit is such that it approximates the brightness of the ceiling, thus eliminating contrasts and causing complete blending between the unit and its background.

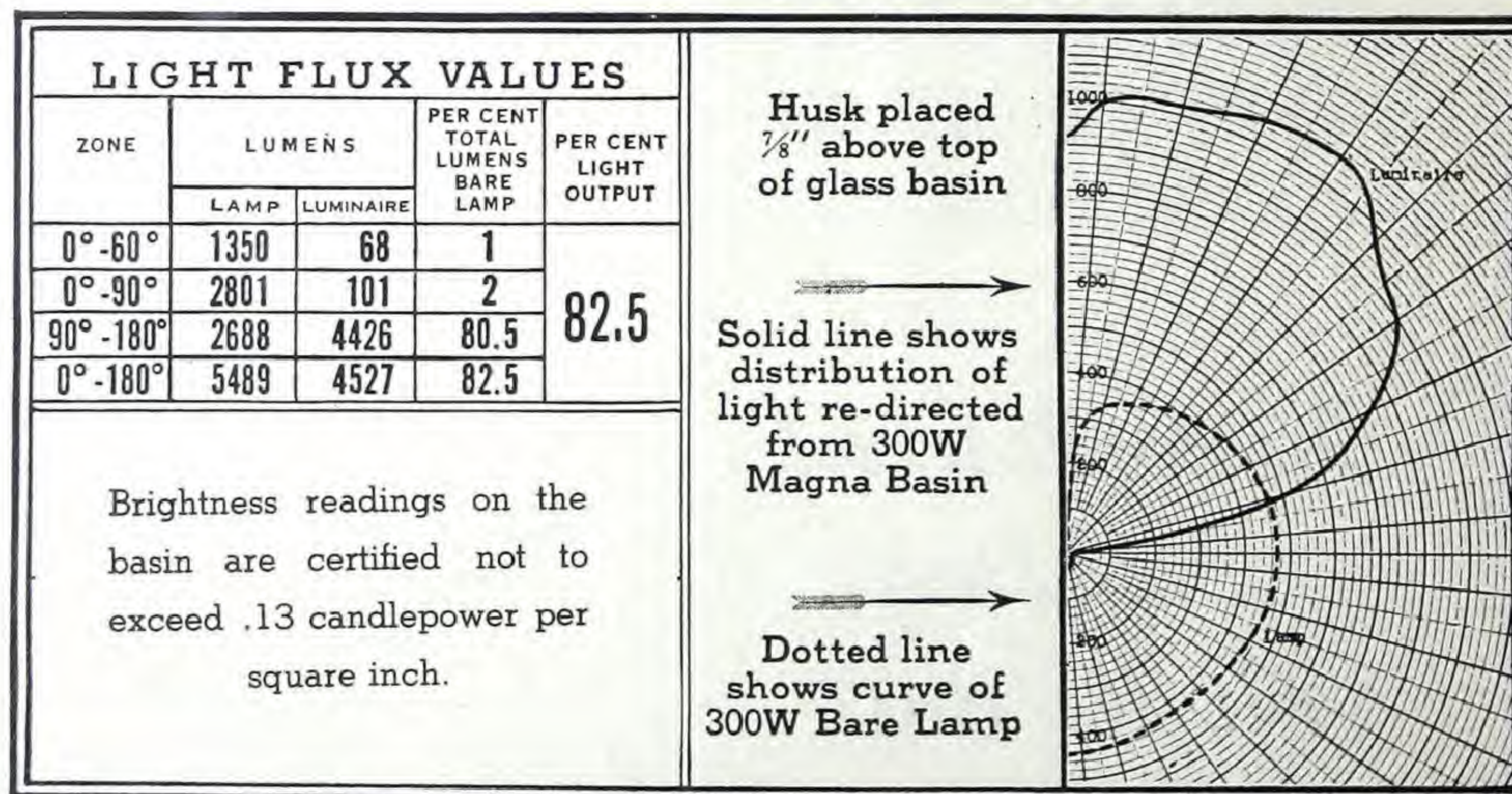
Hangers are of neat and rugged design and have a satin silvertone finish.

## **CATALOGUE INFORMATION**

Cat. No.	Lamp Wattage	Diameter of Basin	Overall Length	Shipping Weight Lbs.
1641	60-100	14 $\frac{3}{8}$ "	24"	11
1642	150-200	16 $\frac{3}{8}$ "	29"	13
1643	300-500	18 $\frac{3}{8}$ "	36"	16
1644	750-1500	22 $\frac{3}{8}$ "	50"	26 $\frac{1}{2}$
1645	150-200	16 $\frac{3}{8}$ "	14 $\frac{1}{2}$ "	14

## **ENGINEERING DATA**

The chart below is from a certified report of Electrical Testing Laboratories.



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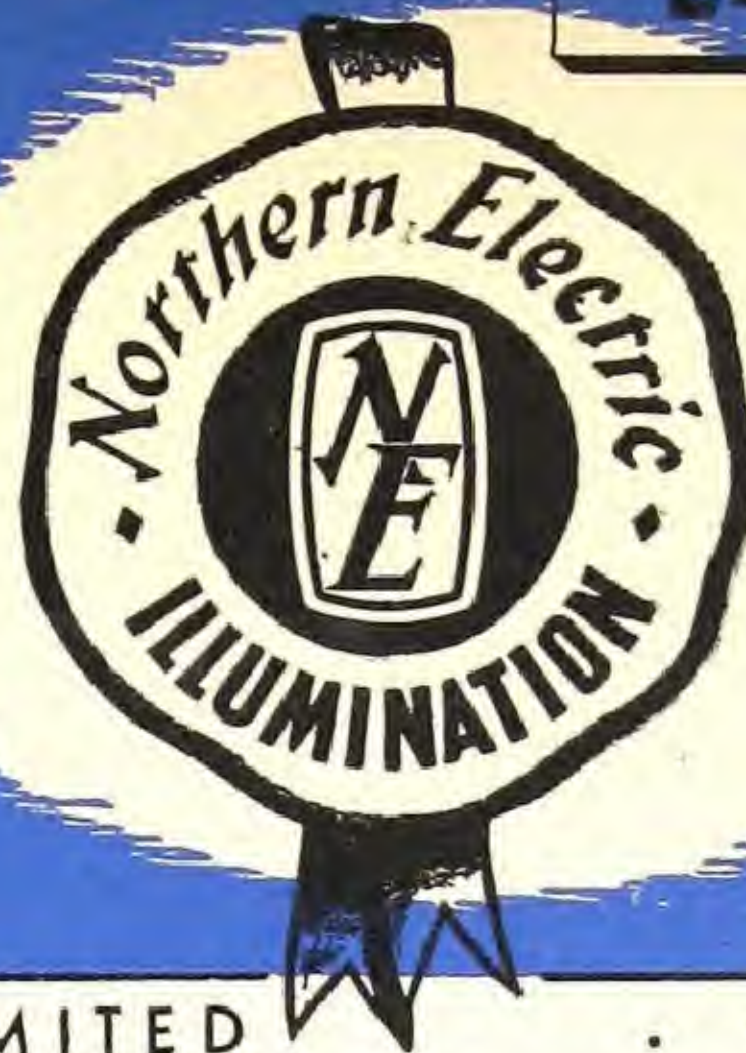


**Nor-Lectric**

September 1944

L-5-4

# BULLETIN



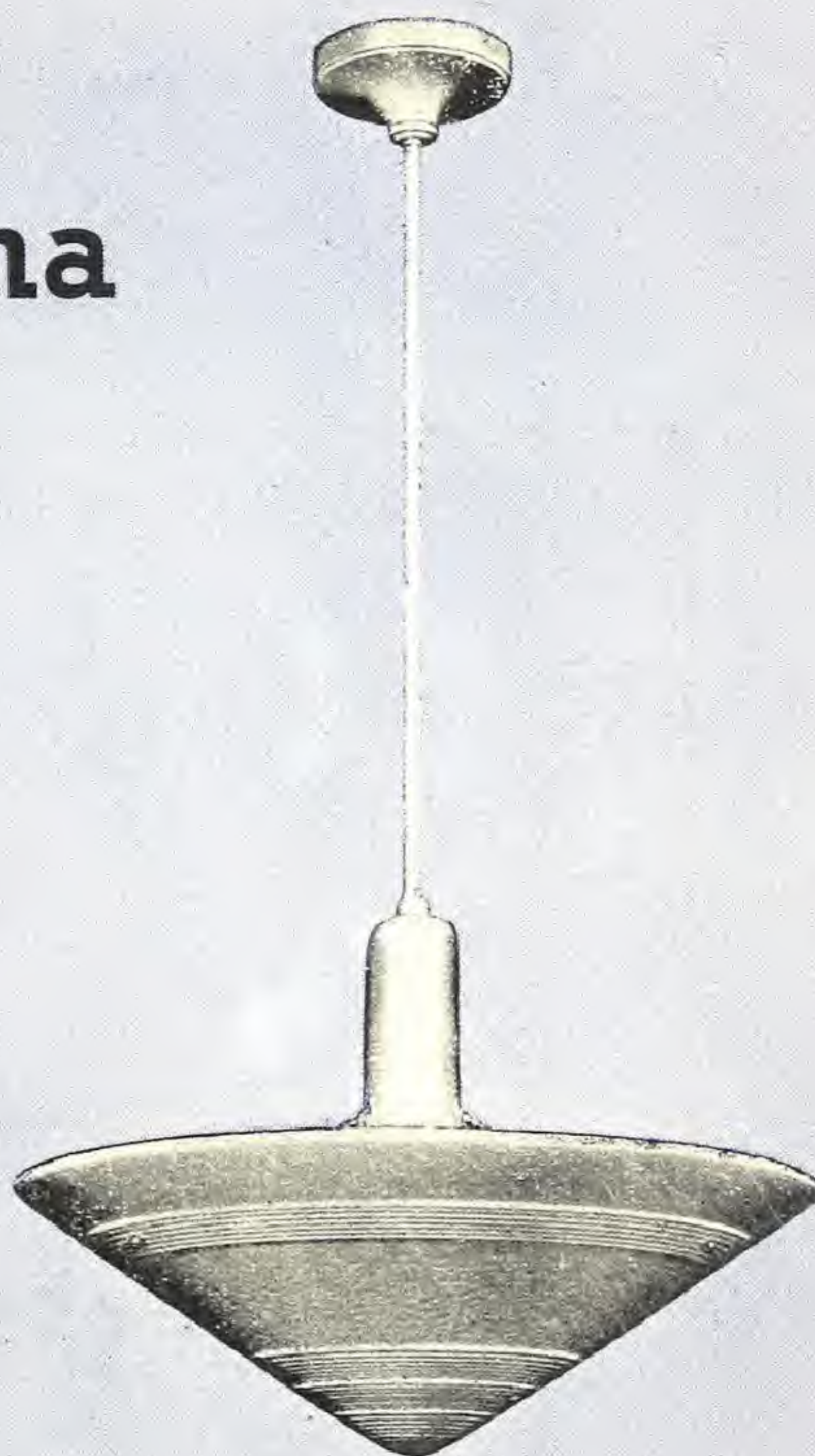
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## The Ainsworth Magna Luminaire

WITH CONICAL  
GRADED-GLASS  
BOWLS

*Incandescent  
Lighting  
At Its Best*



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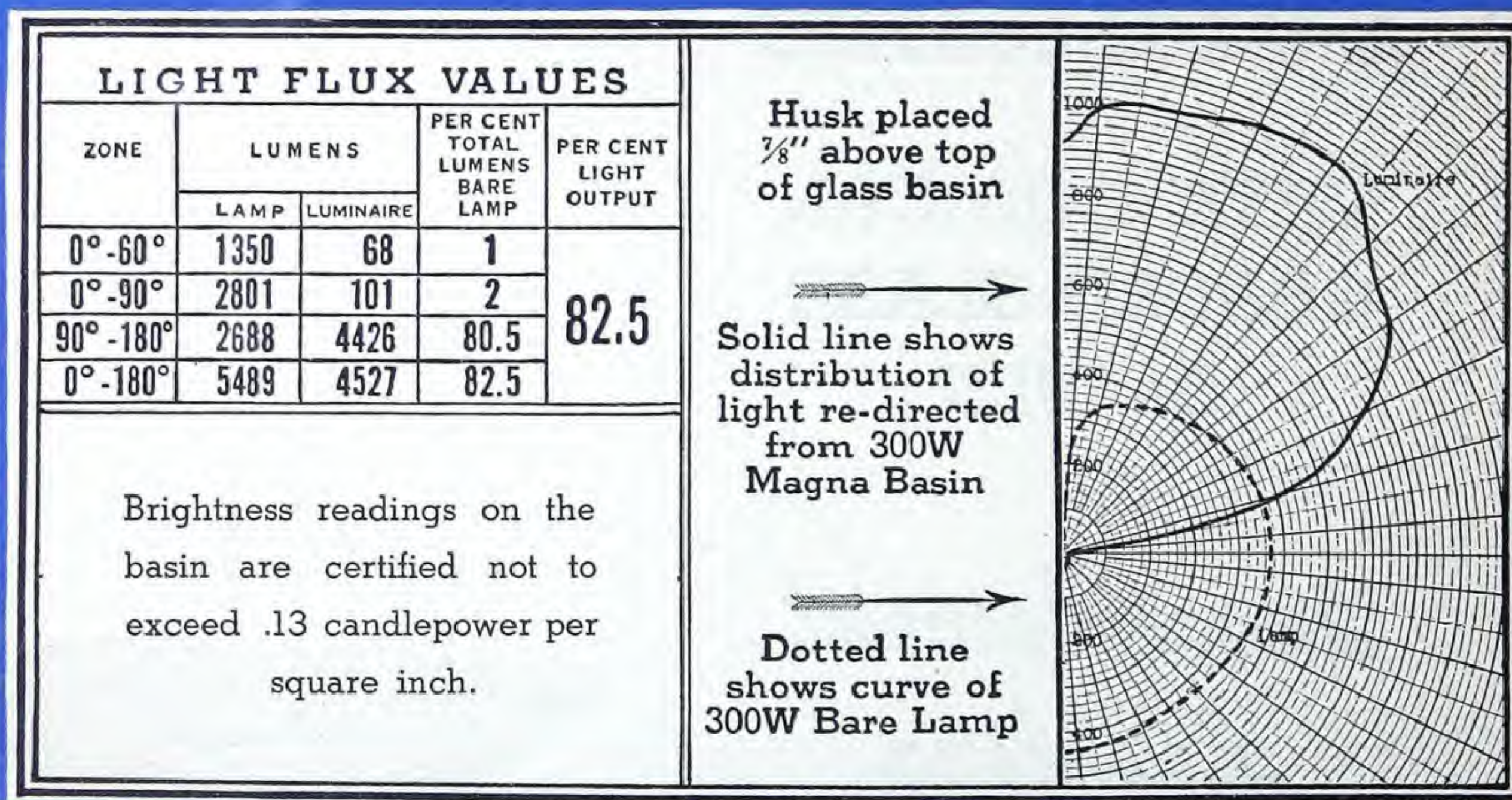
Hangers are of neat and rugged design and have a satin silvertone finish.

### CATALOGUE INFORMATION

Cat. No.	Lamp Wattage	Diameter of Basin	Overall Length	Shipping Weight Lbs.
1643	300-500	18 $\frac{3}{8}$ "	36"	16
1644	750-1500	22 $\frac{3}{8}$ "	50"	26 $\frac{1}{2}$ "

### ENGINEERING DATA

The chart below is from a certified report of Electrical Testing Laboratories.



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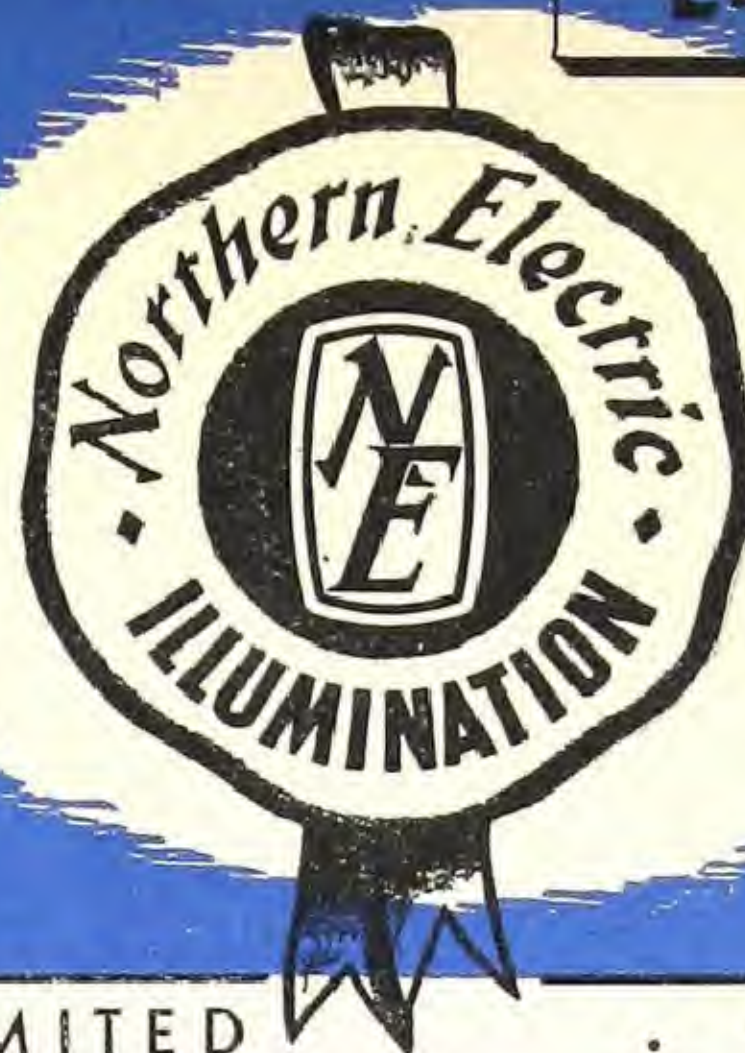
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# *Nor-Lectric* BULLETIN

September 1944

L-5-4



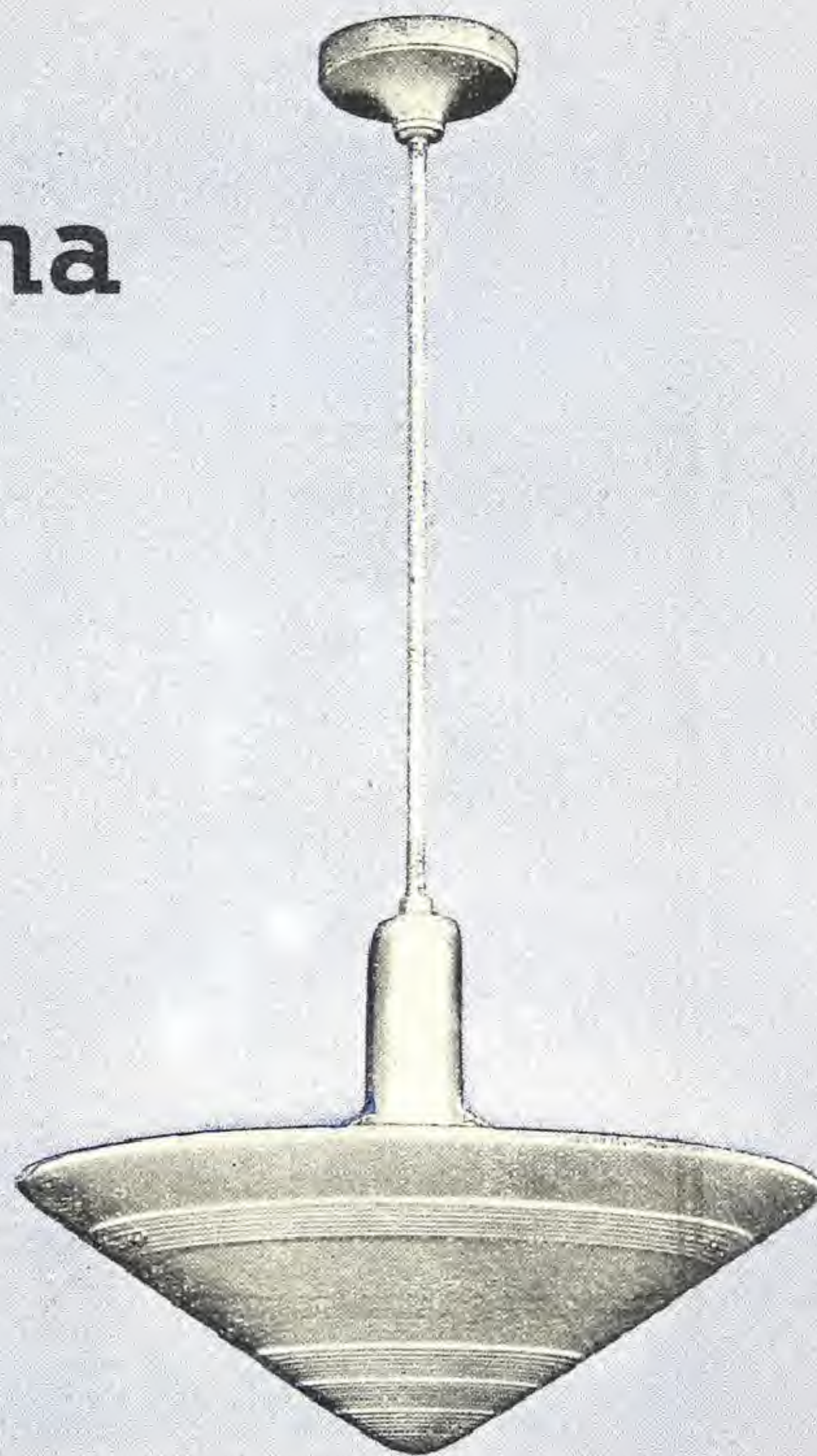
ISHED BY NORTHERN ELECTRIC COMPANY LIMITED

. 1944

## *The* Ainsworth Magna Luminaire

WITH CONICAL  
GRADED-GLASS  
BOWLS

*Incandescent  
Lighting  
At Its Best*



**Northern Electric**  
COMPANY LIMITED

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## AINSWORTH MAGNA UNITS

This unit has been designed to overcome difficulties that were formerly inherent in Incandescent Indirect Lighting. Uniform brightness over the entire depth of the bowl has been achieved by having the glass thickness gradually increased from the outer edge to the apex.

The brightness of the whole unit is such that it approximates the brightness of the ceiling, thus eliminating contrasts and causing complete blending between the unit and its background.

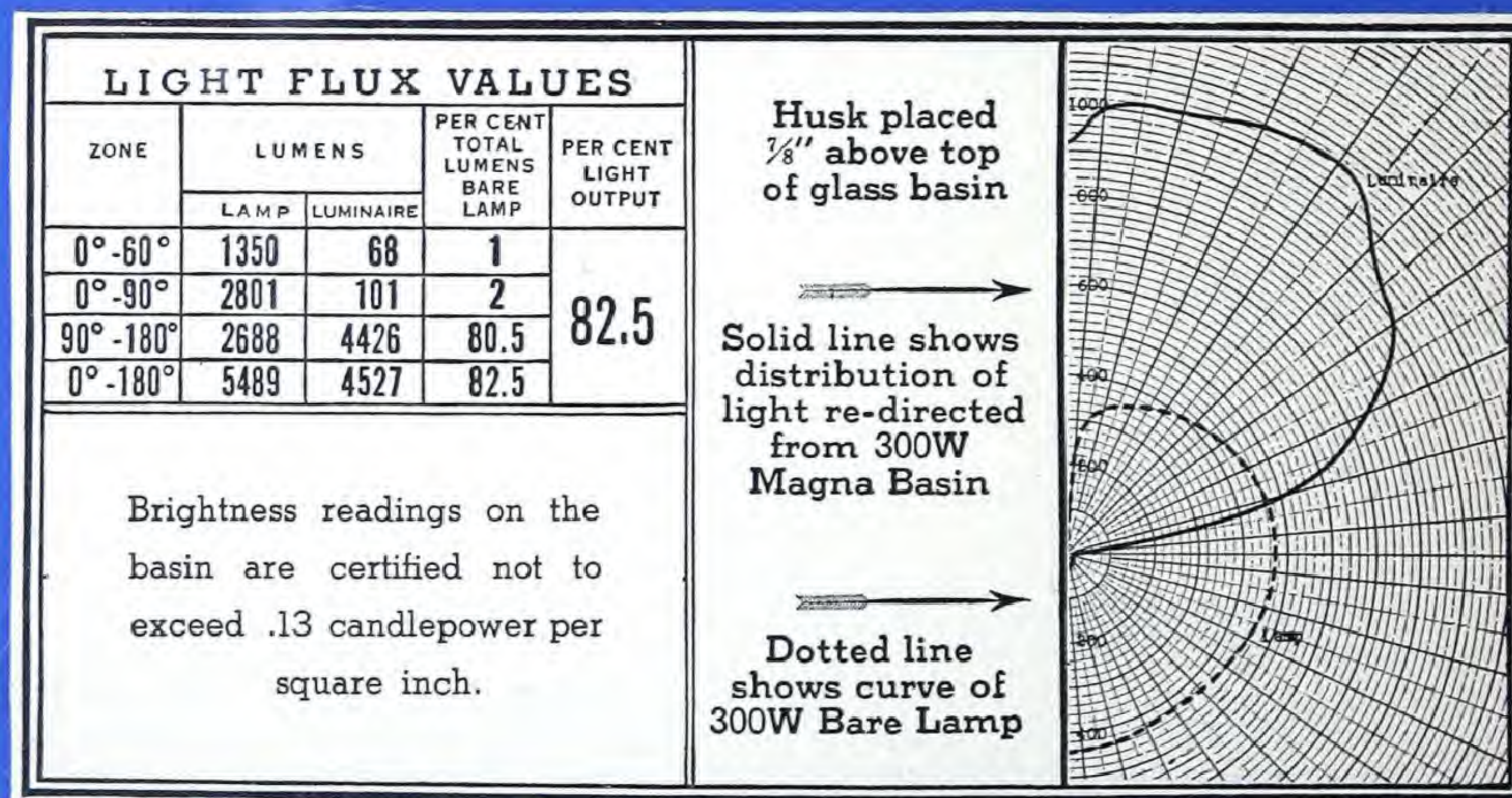
Hangers are of neat and rugged design and have a satin silvertone finish.

### CATALOGUE INFORMATION

Cat. No.	Lamp Wattage	Diameter of Basin	Overall Length	Shipping Weight Lbs.
1643	300-500	18 $\frac{3}{8}$ "	36"	16
1644	750-1500	22 $\frac{3}{8}$ "	50"	26 $\frac{1}{2}$ "

### ENGINEERING DATA

The chart below is from a certified report of Electrical Testing Laboratories.



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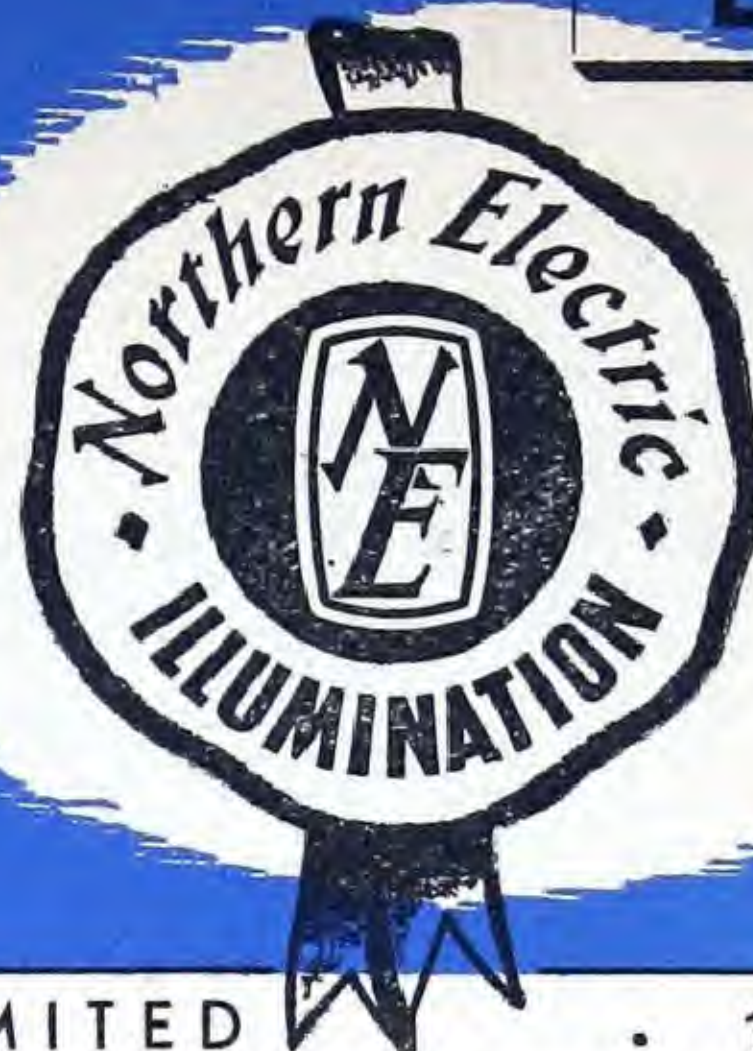
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# Nor-Lectric BULLETIN

January

L-5-6



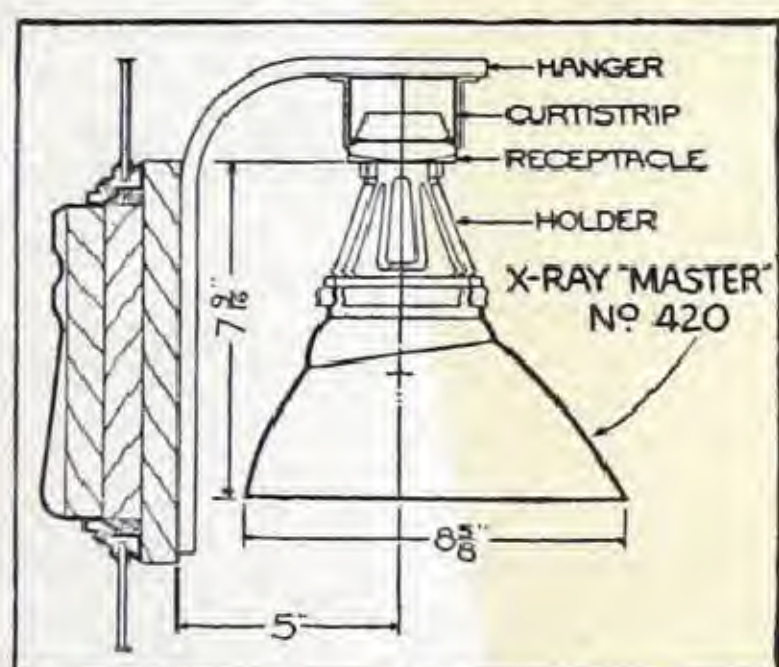
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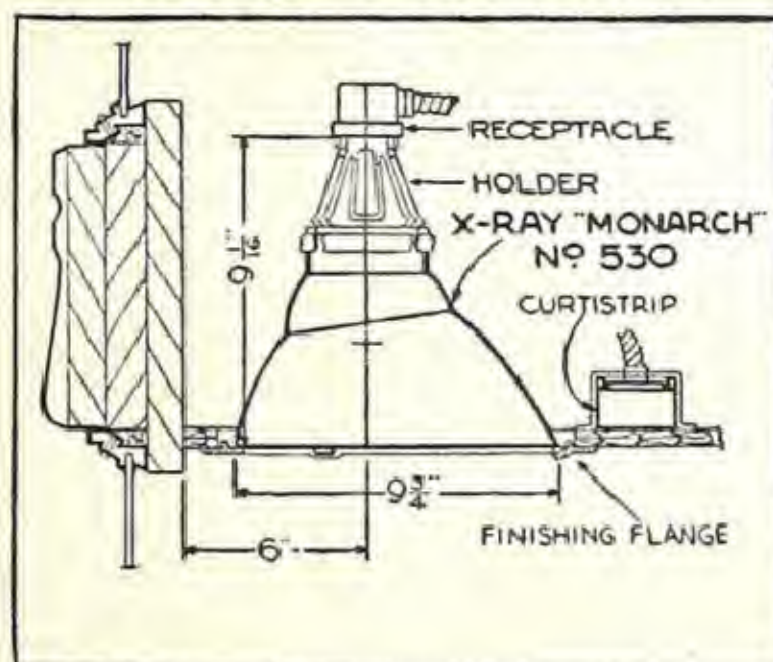
## Show Window Attraction Zone Lighting

"Attraction Zone" X-Ray Reflectors furnish 35% to 50% more high level attention-getting LIGHT at the important sales area

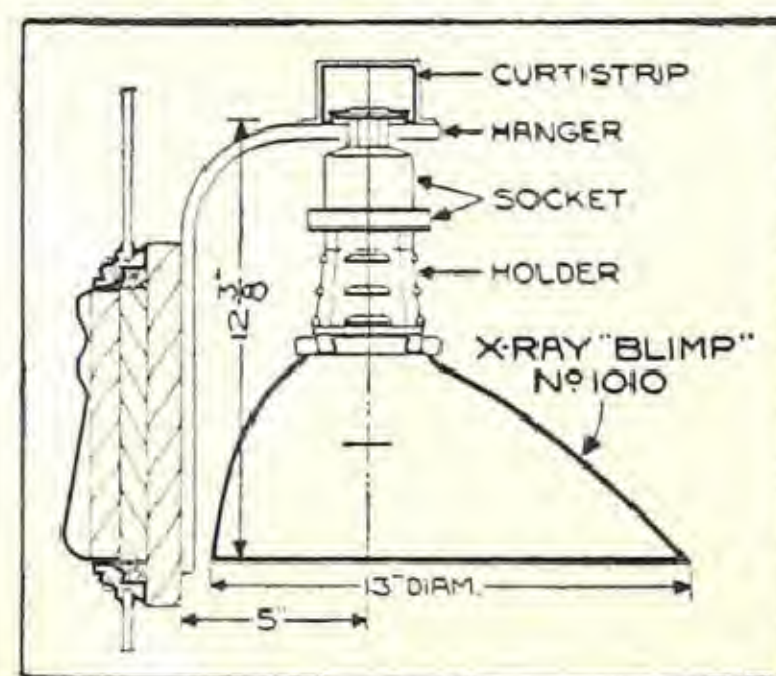
No. 420—MASTER



No. 530—MONARCH



No. 1010—BLIMP



**100 or 150 Watt Lamp** for average size show windows.

Dimensions: Diameter 8 5/8". Height including holder 7 1/16".

Holder: Adjustable type, included, fits sockets with shadeholder groove.

Standard package of ten reflectors and holders weighs 20 pounds.

Finishing Flange: No. 10517.

Plaster Ground: No. 14027.

Louvre: Horseshoe type No. 12420.

Colour Equipment: Not available.

**150, 200 or 300 watt Med. Base Lamp** for average size show windows.

Dimensions: Diameter 9 3/4". Height including holder 9 1/16".

Holder: Adjustable type, included, fits sockets with shadeholder groove.

Standard package of ten reflectors and holders weighs 28 pounds.

Finishing Flange: No. 14026.

Plaster Ground: No. 14028.

Louvre: Horseshoe type No. 12531.

Colour Equipment: Not available.

**300 or 500 Watt Lamp** for large shallow windows or high intensity "Super-lighting."

Dimensions: Diameter 13". Height including holder and socket 12 3/8".

Holder: Special holder and 1/2" mogul socket included.

Standard package of four reflectors, holders and sockets weighs 26 pounds.

Finishing Flange: No. 14110.

Plaster Ground: No. 14111.

Louvre: Horseshoe type No. 12110.

Colour Equipment: No. 10870, includes frame and four gelatins.

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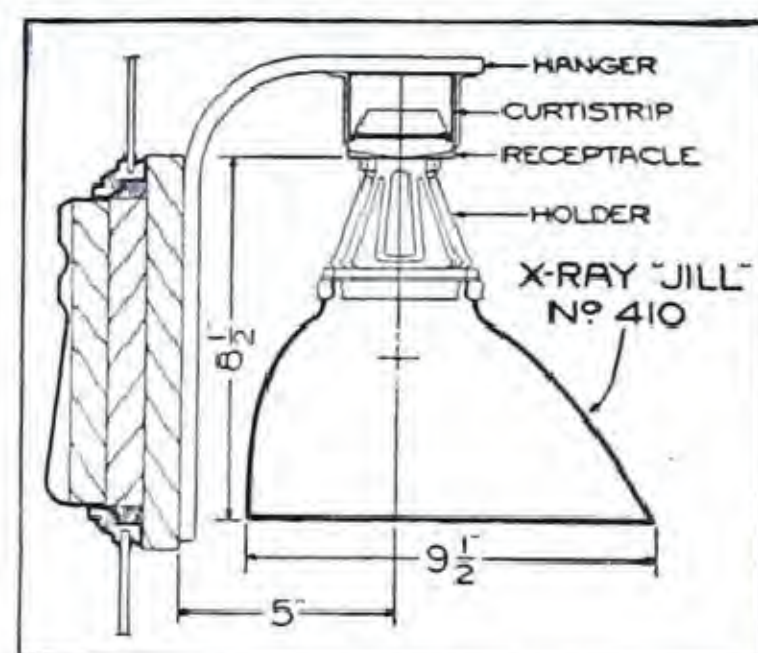
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No. 410—JILL



**100 or 150 Watt Lamp** for average size shallow windows.

Dimensions: Width  $9\frac{3}{8}$ ". Depth front to back  $9\frac{1}{2}$ ". Height including holder  $8\frac{1}{2}$ ".

Holder: Adjustable type, included, fits sockets with shadeholder groove. Standard package of ten reflectors and holders weighs 25 pounds.

Finishing Flange: No. 11410.

Plaster Ground: No. 14006.

Louvre: No. 12410-N, vanes at right angle to glass. No. 12410-P, vanes parallel to glass.

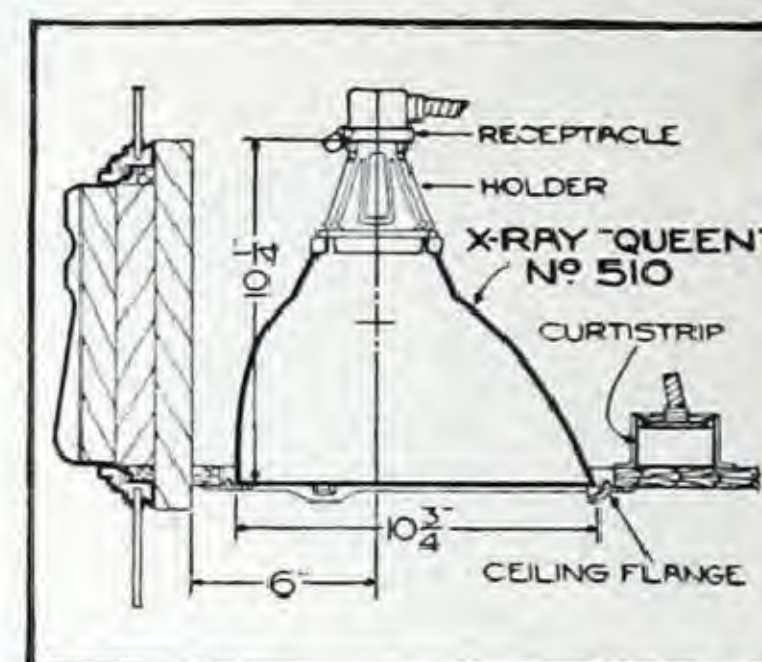
Colour Equipment: No. 441, includes frame and four gelatins.

## X-RAY SEMI-CONCENTRATING WINDOW REFLECTORS



for use in show windows where the mounting height of the reflectors is greater than the depth of the window. These reflectors provide the needed adequate general illumination yet have a strong punch of light downward to properly highlight displayed merchandise.

No. 510—QUEEN



**150, 200 or 300 Watt Medium Base Lamp** for average size shallow windows.

Dimensions: Width  $10\frac{1}{2}$ ". Depth front to back  $10\frac{3}{4}$ ". Height including holder  $10\frac{1}{4}$ ".

Standard package of ten reflectors and holders weighs 38 pounds.

Finishing Flange: No. 11510.

Plaster Ground: No. 14007.

Louvre: No. 12510-N, vanes at right angle to glass. No. 12510-P, vanes parallel to glass.

Colour Equipment: No. 55, includes frame and four gelatins.

## SHOW WINDOW AND INTERIOR FLOODLIGHTS

### FOR HIGHLIGHTING AND SPOTLIGHTING, *with or without Colour Effects*

Three general types of light control are provided with X-Ray Interior Floodlights.

#### "Center SPOT Beam"

A combined flood and spotlight, the Center SPOT Beam concentrating type of reflector is a dual purpose unit and has a wide range of uses because of its concentration and wide general illumination. Small store windows can be furnished with general lighting with one or two of these floodlights and have the principal portions of the display "highlighted" at the same time.

#### "SPOT Beam"

Where a spotlight effect is wanted, use the No. 33 and No. 88 type floodlights with control rings to eliminate the spill light. They are more efficient than lens type units and will provide a powerful, high intensity spot.

#### "WIDE-SPREAD Beam"

Floodlights of the No. 338 and No. 888 types are true floodlights having a beam spread of 100 degrees. The main beam spread is approximately 40 degrees.



## INTERIOR FLOODLIGHTS Center Spot Beam

### No. 44—For 100-150 Watt, I.F. Lamp

Dimensions: Diameter  $8\frac{5}{8}$ ". Depth from back of socket to front of reflector 7" with 100 watt lamp,  $7\frac{1}{2}$ " with 150 watt lamp using holder extension.

Holder: No. 10300 and Holder Extension No. 10012—included.

Socket: No. 8052-S—included.

Adjustable Base: No. 10416—included.

Standard package of ONE unit weighs 5 pounds.

### For 200 Watt Lamp

#### No. 33-A—With Colour Equipment

#### No. 33-B—Without Colour Equipment

Dimensions: Diameter  $10\frac{1}{2}$ ". Depth from back of socket to front of reflector  $10\frac{3}{4}$ ".

Holder: No. 10800—included.

Socket: No. 8052-S—included.

Adjustable Base: No. 10416—included.

Colour Equipment: No. 10556—included with No. 33-A.

Control Ring: No. 13351.

Standard package of ONE unit weighs 7 pounds.

### For 300-500 Watt Lamp

#### No. 88—With Colour Equipment,

#### No. 88-B—Without Colour Equipment,

Dimensions: Diameter  $13\frac{1}{4}$ ". Depth from back socket to front of reflector  $11\frac{1}{8}$ ".

Holder: No. 10414—included.

Socket: No. 8099-S—included.

Adjustable Base: No. 10416—included.

Colour Equipment: No. 10470—included with No. 88.

Control Ring: No. 18860.

Standard package of ONE unit weighs 12 pounds.



"Center SPOT Beam"



## INTERIOR FLOODLIGHTS — Wide Spread Beam

These X-RAY INTERIOR FLOODLIGHTS provide a wider beam spread than those shown above. Thus, they cover a wider area at the same mounting height.

### For 200 Watt Lamp

#### No. 338—With Colour Equipment

#### No. 338-B—Without Colour Equipment

Dimensions: Diameter  $10\frac{1}{2}$ ". Depth from back of socket to front of reflector  $9\frac{3}{4}$ ".

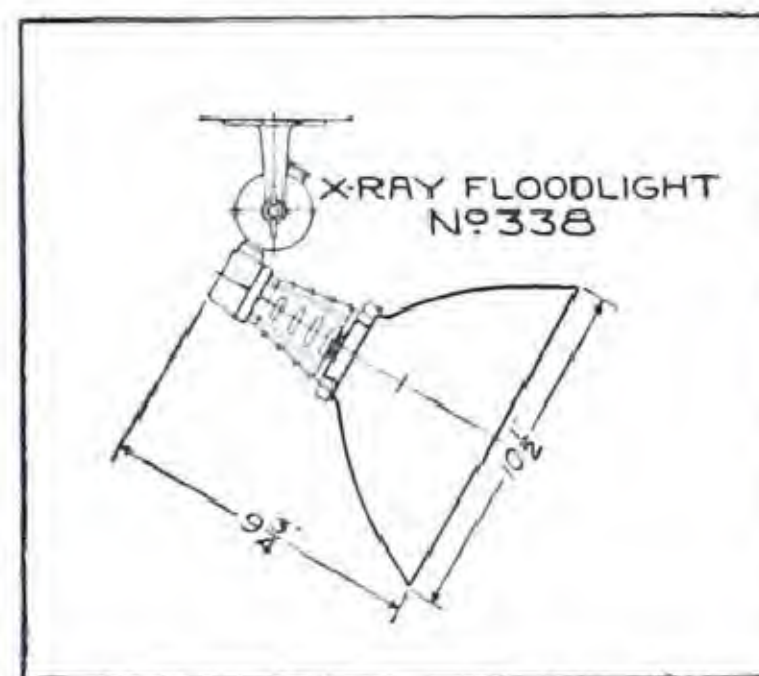
Holder: No. 10367—included.

Socket: No. 8052-S—included.

Adjustable Base: No. 10416—included.

Colour Equipment: No. 10370—included with No. 338.

Standard package of ONE unit weighs 7 pounds.



### For 300-500 Watt Lamp

#### No. 888—With Colour Equipment,

#### No. 888-B—Without Colour Equipment,

Dimensions: Diameter  $13\frac{1}{4}$ ". Depth from back of socket to front of reflector  $11\frac{1}{8}$ ".

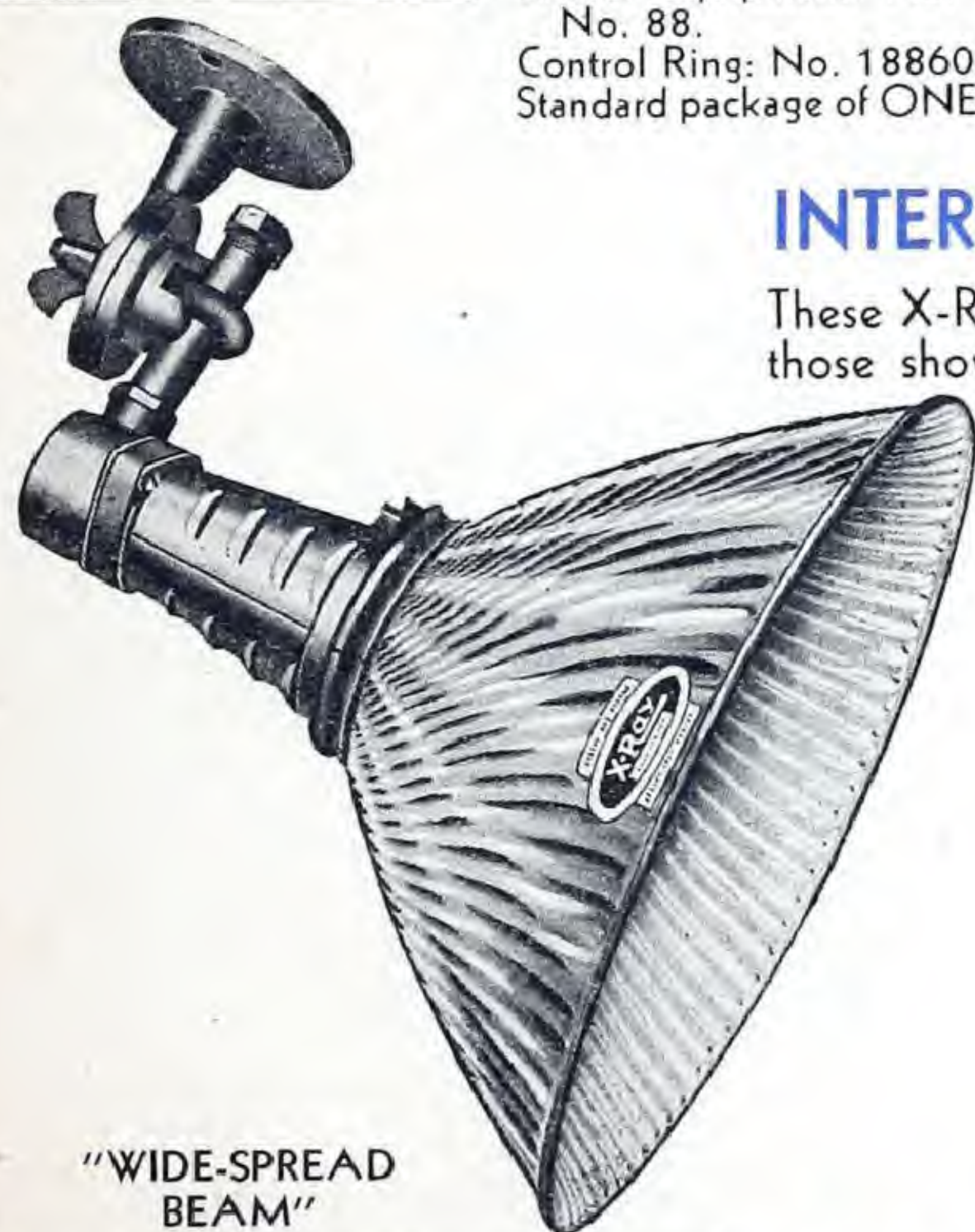
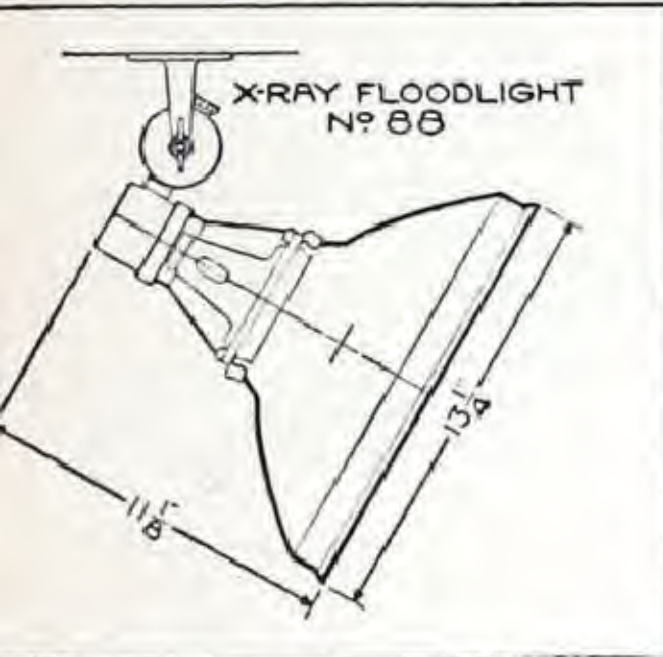
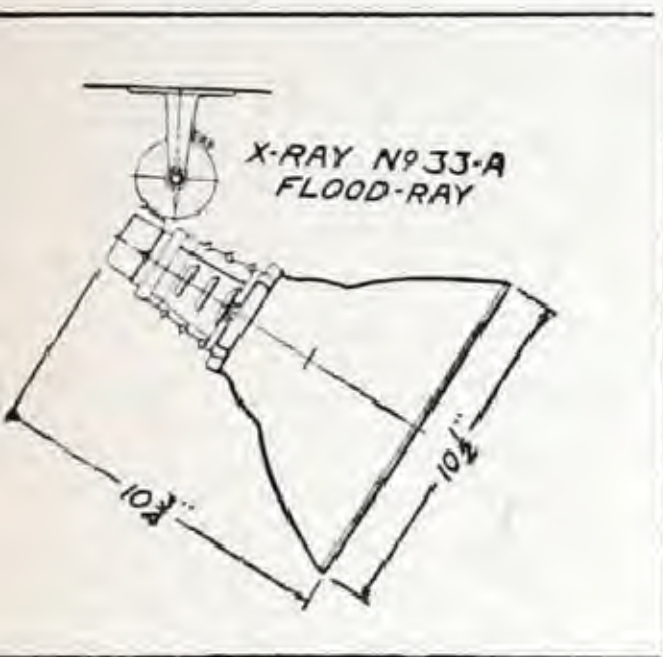
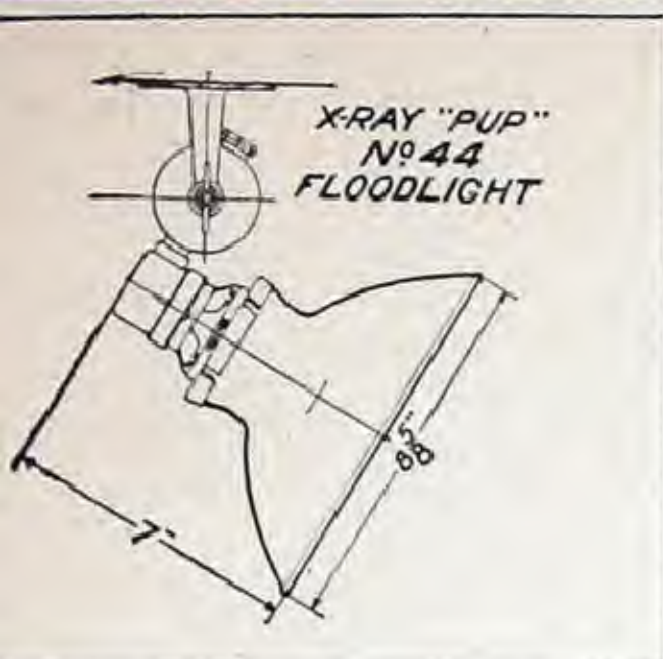
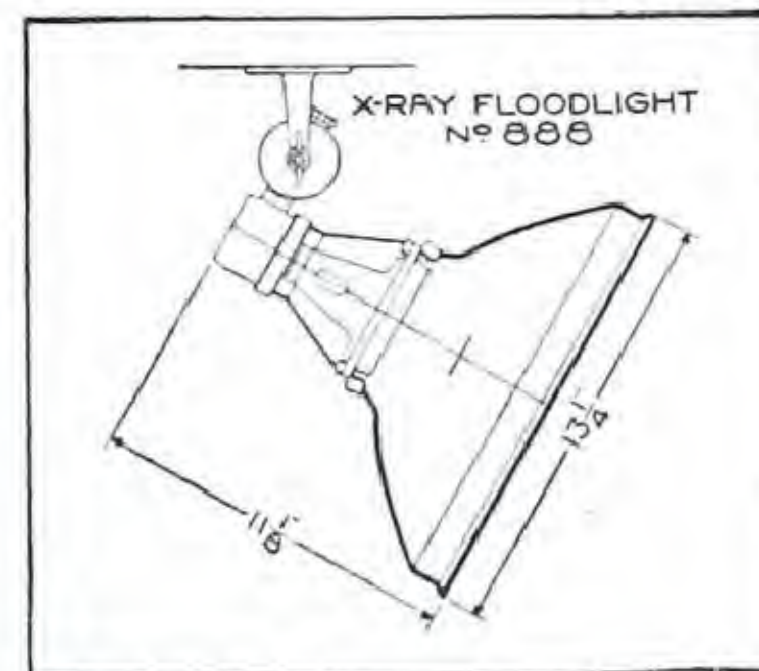
Holder: No. 10414—included.

Socket: No. 8099-S—included.

Adjustable Base: No. 10416—included.

Colour Equipment: No. 10470—included with No. 888.

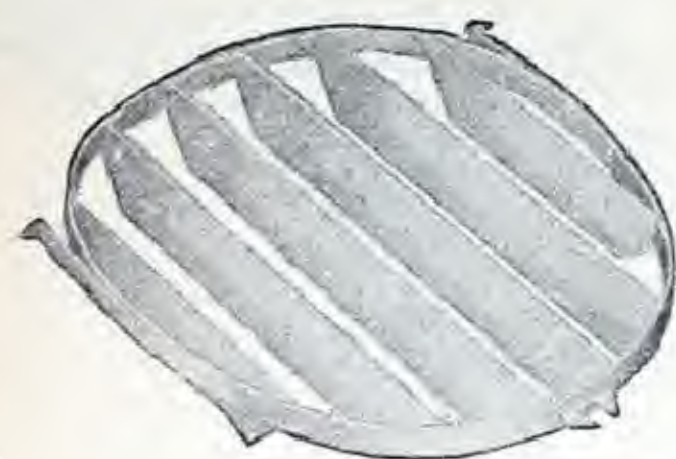
Standard package of ONE unit weighs 12 pounds.



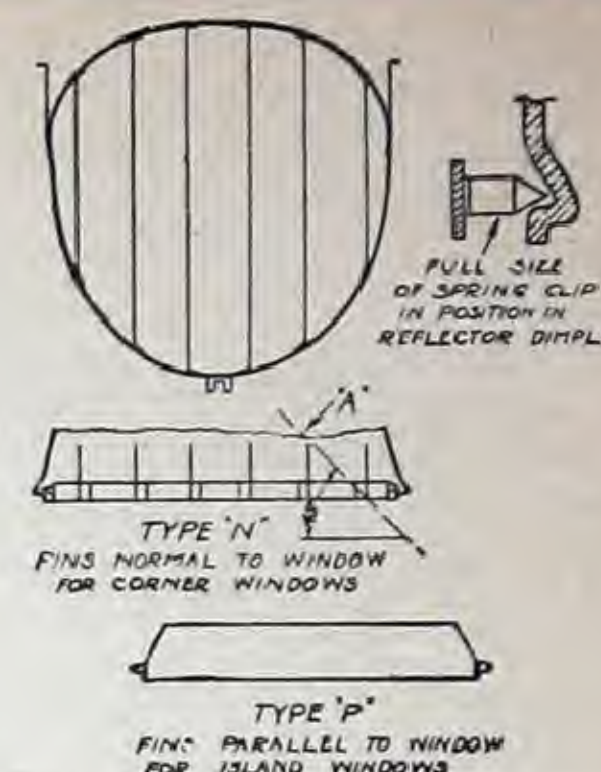
"WIDE-SPREAD BEAM"





**"LOUVRES"****For Concealing Light Source from View**

Cat. No.	For Use With	Standard Package of ONE Unit Weighs	Code Word
<b>12400-N</b>	No. 400 Reflector	1 lb.	Adam
<b>12410-N</b>	No. 410 Reflector	1 lb.	Adela
<b>12410-P</b>	No. 410 Reflector	1 lb.	Clara
<b>12510-N</b>	No. 510 Reflector	1 lb.	Alice
<b>12510-P</b>	No. 510 Reflector	1 lb.	Cyril
<b>12110</b>	Horseshoe type with No. 1010 Reflector	semi-circular Fins	Emma
<b>12531</b>	No. 530 Reflector	1 lb.	Marge



Corner or island type windows often require a means of shielding the lamps and light from reflectors along the adjacent side. X-Ray "Louvres" are a standardized accessory that can be installed at any time in dimpled X-Ray reflectors. Hinged sections of continuous louvres available on special order.

**"COLOR-RAY"****Colour Equipment for Colour Lighting**

"Color-Ray" is an accessory for producing colour lighting effects with standard X-Ray Window Reflectors. It is a simple metal frame holding coloured gelatin, that clips securely onto the reflector. It is very easy to install or to change colours in "Color-Ray."



"Color-Ray" consists of metal frame with four sheets of coloured gelatin (red, blue, green and amber)

Cat. No.	For Use With	Weight *Std. Pkg.	Code Word
<b>440</b>	400 "Jack" .....	7 lbs.	Lily
<b>441</b>	410 "Jill" .....	7 lbs.	Pansy
<b>55</b>	500 and 510 .....	7 lbs.	Aster
<b>99</b>	900 and 910 .....	7 lbs.	Tulip
<b>10870</b>	1010 "Blimp" .....	7 lbs.	Clover

\*Standard Package 10.

**COLOUR GELATIN SHEETS**

**Size 11 1/2" x 11 1/2"**  
For Nos. 440 and 441, also  
Nos. 33-A, 303-A, 338.

**Size 15" x 15"**  
For Nos. 55, 99 and 10870,  
also Nos. 88, 808 and 888.

Cat. No.	Colour	Code Word	Cat. No.	Colour	Code Word
<b>10372</b>	Red	Rose	<b>10472</b>	Red	Magenta
<b>10373</b>	Amber	Jonquil	<b>10473</b>	Amber	Daffodil
<b>10374</b>	Green	Smilax	<b>10474</b>	Green	Myrtle
<b>10375</b>	Blue	Gentian	<b>10475</b>	Blue	Ageratum

Standard Package: 10 sheets weigh approximately one pound.

**HOW TO RECESS X-RAY WINDOW REFLECTORS**

Recessing reflectors and wiring above the ceiling of the show window makes the installation neater and more finished in appearance. Most show window lighting jobs today are of this type, especially where the show window is enclosed.

In these instances X-Ray Finishing Flanges are used to support the reflectors flush with the bottom of a ceiling of either plywood or plaster.



X-Ray flanges are light in weight and finish off the openings cut through the ceiling. They support the reflector in its proper position and reinforce the ceiling that would otherwise be weakened after openings are cut.

X-Ray Plaster Rings serve as a ground to which to plaster and as a base for securely mounting the finishing flanges.

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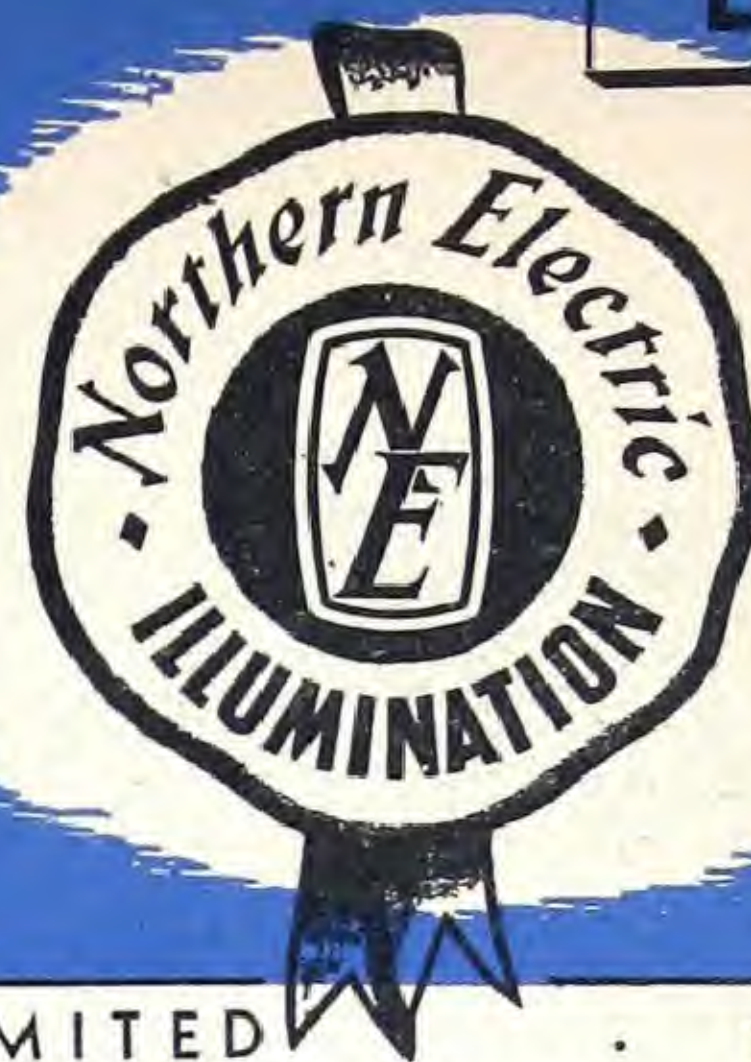
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# Nor-Lectric BULLETIN

October 1944

L-5-9



ISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

Why wait for Fluorescent  
to light Stores?

**F**OR attention getting, sparkling display lighting, there is nothing better than incandescent lamps in modern, high intensity Holophane Counterlites.

Dramatize the most vital sales area—the counter—adequately illuminate the shelves and traffic aisles.

"The Counterlite" is effective and efficient. In many stores, Counterlites alone are sufficient to provide illumination for the entire store interior.

The prismatic glass light controlling surfaces are impervious to permanent depreciation. Maintenance is easy, the glassware can be completely cleaned with little trouble. Recessed and surface mounting models.

ILLUMINATION TABLE

Spacing along counter in feet		6	8	10	12
		Average foot candles on counter with 300 watt lamps			
Mounting above counter in feet	6	148	110	—	—
	8	107	80	64	—
	10	81	61	49	41
	12	64	48	38	32
	14	51	38	31	26

CATALOGUE DATA

Cat. No.	Size Lamp	Roughing Box			Face Plate		Plaster Opening		Weight Lbs.
		Length	Width	Depth	Length	Width	Length	Width	
F-814	300*	13 3/4"	13 3/4"	7"	15 3/8"	15 3/8"	14 1/2"	14 1/2"	26
E-814	300*	14 1/2"	14 1/2"	18 3/8"	.....	.....	.....	.....	24

\*300 watt medium base lamp—6" Light Centre.



COUNTERLITE  
FOR SURFACE MOUNTING



EMPHASIS ON DISPLAY

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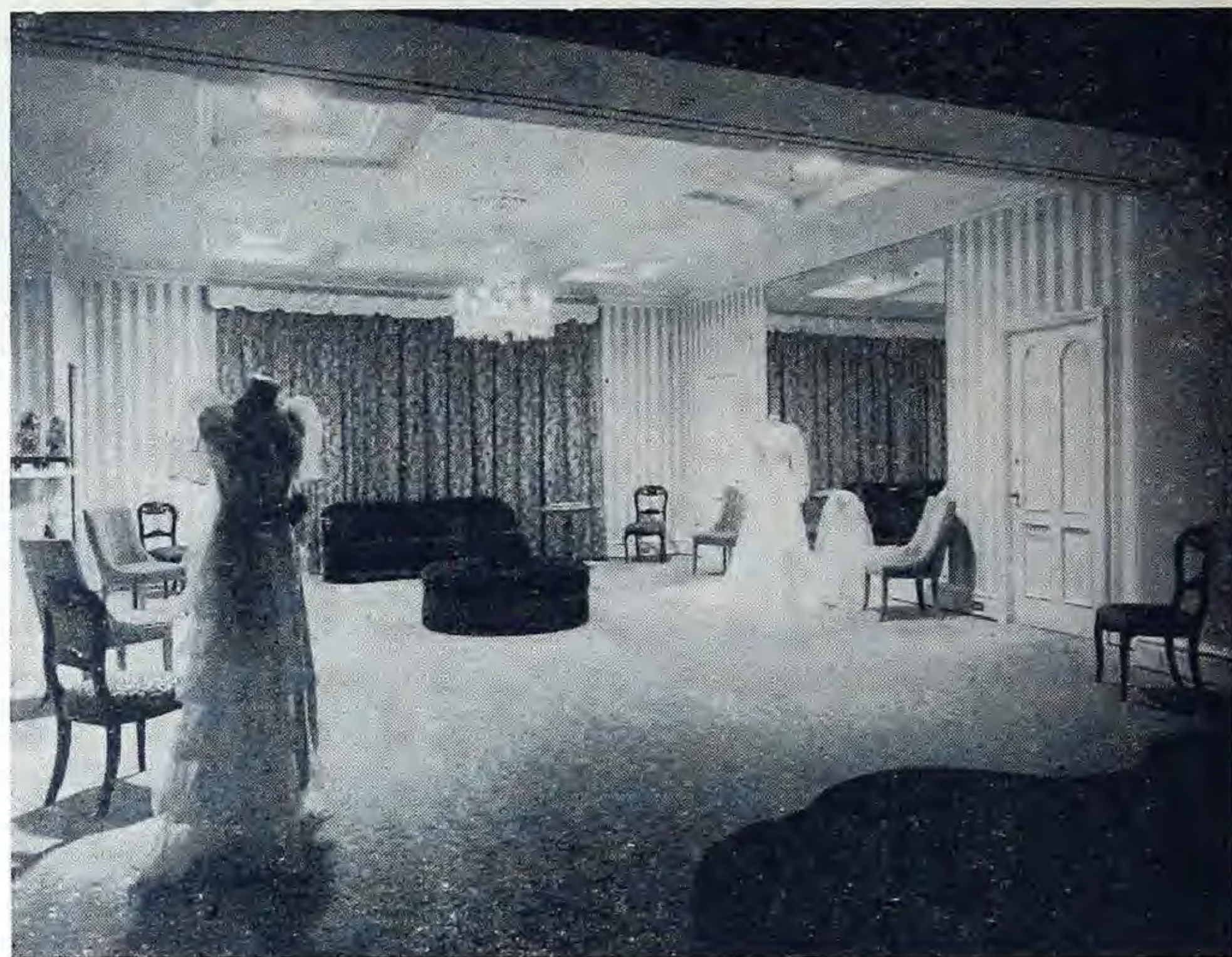
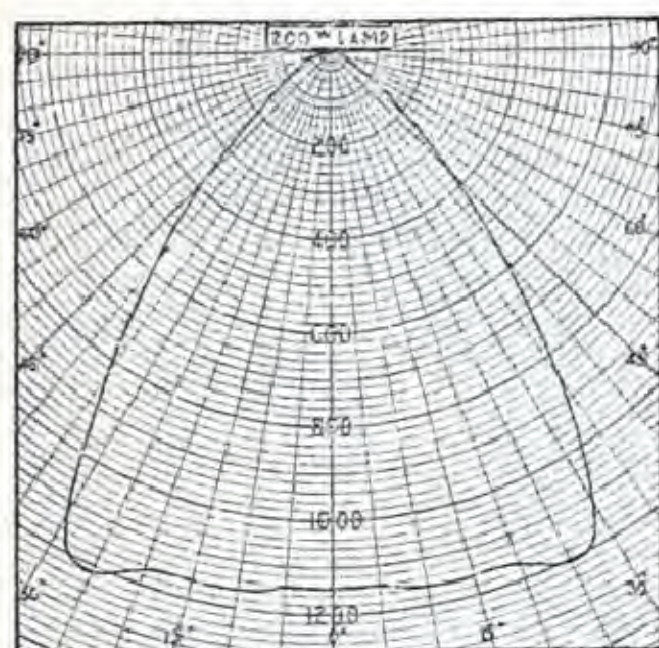
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## Smartness and Complete Satisfaction in Recessed Store Lighting



**R-1894 IN-BILT FLUSH  
TYPE CONTROLENS UNIT**



New design eliminates metal housing to substantially reduce purchase and installation costs. Controlens combined with prismatic reflector gives effective "down light" without glare.

More useful footcandles are developed because light is transmitted and directed without the interference

of fins, louvres, control rings or other mechanical devices resorted to in less efficient equipment.

This unit is best suited for general lighting of stores, studios, banks, etc. As it has an intensive distribution, it should be installed on spacings not exceeding  $1\frac{1}{4}$  times the mounting height.

Catalogue Number	DIMENSIONS			Wattage
	Dia. Face Plate	Dia. Plaster Opening	Recessing Depth	
<b>R-1894</b>	15½"	15"	12¼"	200-300* *6" light centre med. base lamp.

### IN-BILT REFLECTOR-REFRACTORS

For very low ceilings, or higher ceilings with widely spaced outlets, these reflector-refractor units are of the greatest value. They have the power to distribute the illumination widely enough to overcome the handicaps in either condition.

Catalogue No.	Distribution	Lamp Size	Standard Quantity	Shipping Weight
<b>R-2110</b>	Extensive	100	6	36
<b>R-2120</b>	Extensive	150	6	48
<b>R-2130</b>	Extensive	200	6	72
<b>R-2133</b>	Intensive	200	6	72
<b>R-2140</b>	Extensive	300	6	102
<b>R-2143</b>	Intensive	300	6	102





## Better Light-Better Sales

Scientific planning plus precision design of lighting equipment is the surest and thriftiest way of producing effective store lighting. Holophane Research Engineers understand store lighting. They have studied retail sales activities and have designed lighting equipment specifically for the purpose.

Catalogue Number	Standard Quantity	Quantity Shipping Weight	Diameter Ceiling Ring	Diameter Plaster Opening	Rec. Depth
<b>R-5544</b>	6	148	18 $\frac{1}{4}$ "	17 $\frac{3}{4}$ "	7 $\frac{1}{2}$ "

**WATTAGE:** 200 Watt Mazda  
300 Watt 6" Light Centre Medium Base

Catalogue Number	Standard Quantity	Quantity Shipping Weight	Dimensions		Mazda Lamp
			Diameter	Depth	
<b>C-5540</b>	3	66	15 $\frac{3}{8}$ "	13"	200-300*
<b>S-5540</b>	3	67	15 $\frac{3}{8}$ "	32"	200-300*

\*300 watt, medium base, 6" light centre lamp.

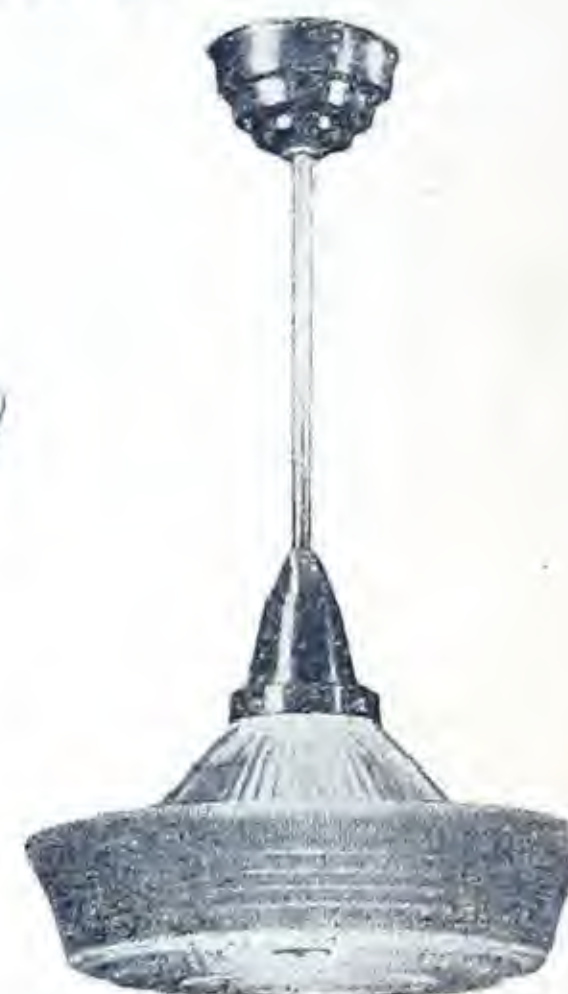


**R-5544 SEMI-RECESSED  
CORRECTALITE**



**No. C-5540**

**SURFACE  
MOUNTED  
CORRECTALITES**



**No. S-5540**



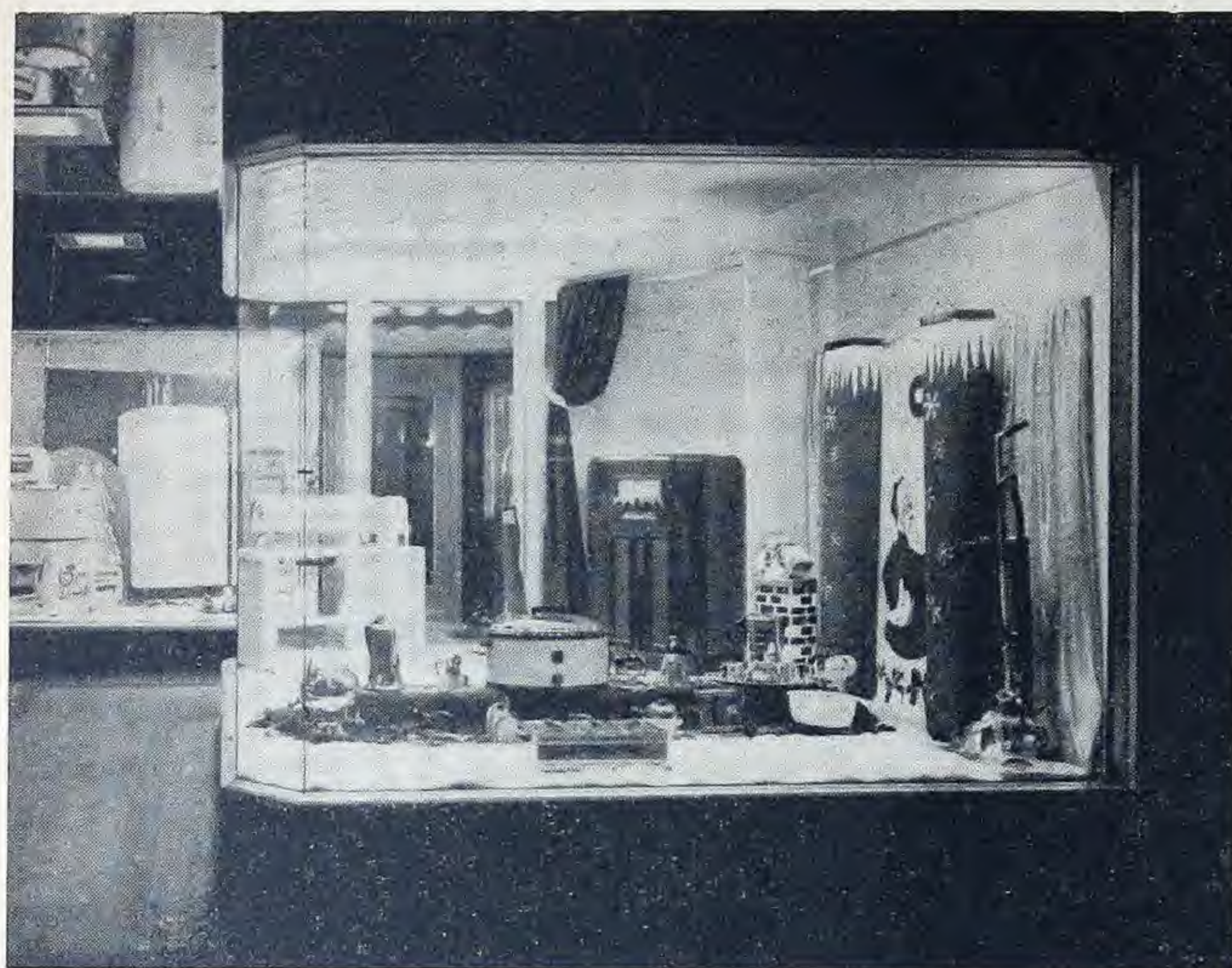
**CORRECTALITES** are correct and superior in

- *Efficiency*
- *Beauty*
- *Simplicity*
- *Economy*

Recessed Correctalite combines beauty and efficiency. It harmonizes with all types of interiors and with precise re-direction brings greater concentration of illumination on display and sales areas. Space 1 $\frac{1}{4}$  times mounting height.



## Show Window Lighting



The store owner and the display manager have always aimed to achieve the novel, even the ultra modern, in an attractive way—often in their store fronts—but always in their displays. Frequently the lighting is as much an obstacle as an aid to the end in view. If deep shadows do not distort, feather shadows confuse, or, a too complete diffusion robs the setting of all its drama.

In recognition of the ever-varying needs in the many and greatly differing types of windows, we offer reflectors to cover the field.



No. 938

Where built-in lighting is needed for complete concealment of source, there is the special reflector and lens unit No. 938. Especially designed for quality lighting in every way.



No. 936

For all-round fully adaptable window lighting utility with maximum economy and service the No. 936.



Nos. 940 and 916

For built-in lighting with a concentrated distribution appropriate to high windows, the Nos. 940 and 916.



No. 963

For high narrow windows, or concentrated accent lighting, the No. 963 is an inexpensive shadeholder reflector.



Nos. 981 and 983

For deeper low windows the No. 981-No. 983 reflectors. Shadeholder type will be found efficient and economical.

**ALL OF THESE MOST EFFICIENT HOLOPHANE REFLECTORS ARE IMMEDIATELY AVAILABLE**

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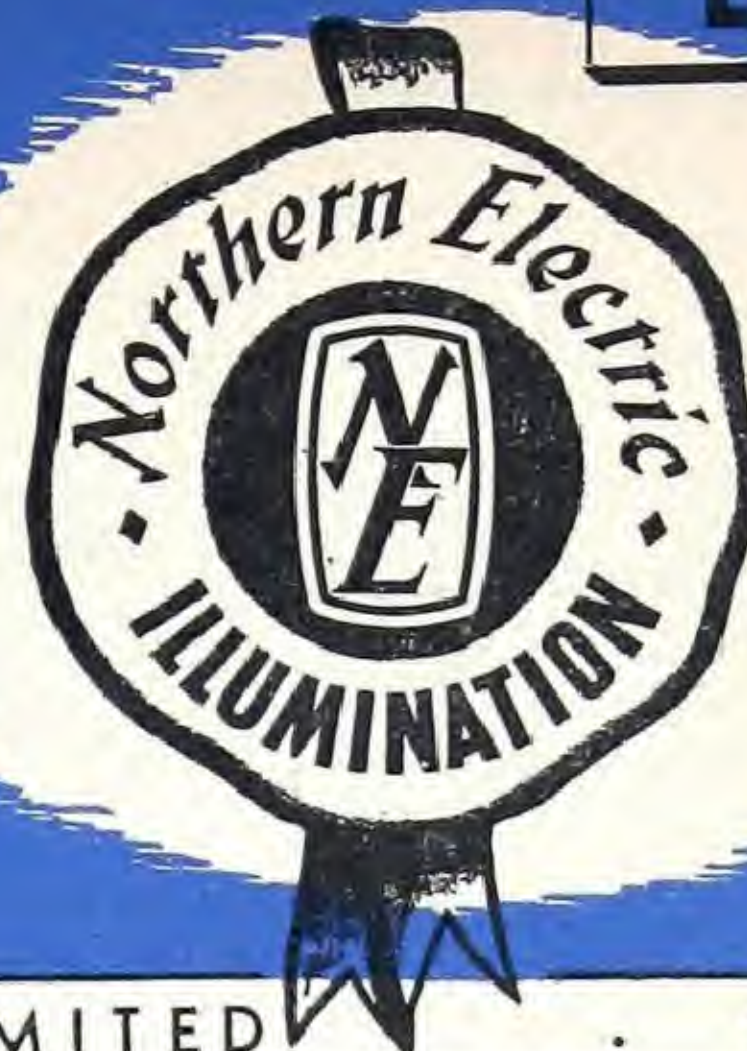
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### ILLUMINATION TABLE

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Mounting above counter in feet		Average foot candles on counter with 300 watt lamps			
6	6	148	110	—	—
8	8	107	80	64	—
10	10	81	61	49	41
12	12	64	48	38	32
14	14	51	38	31	26

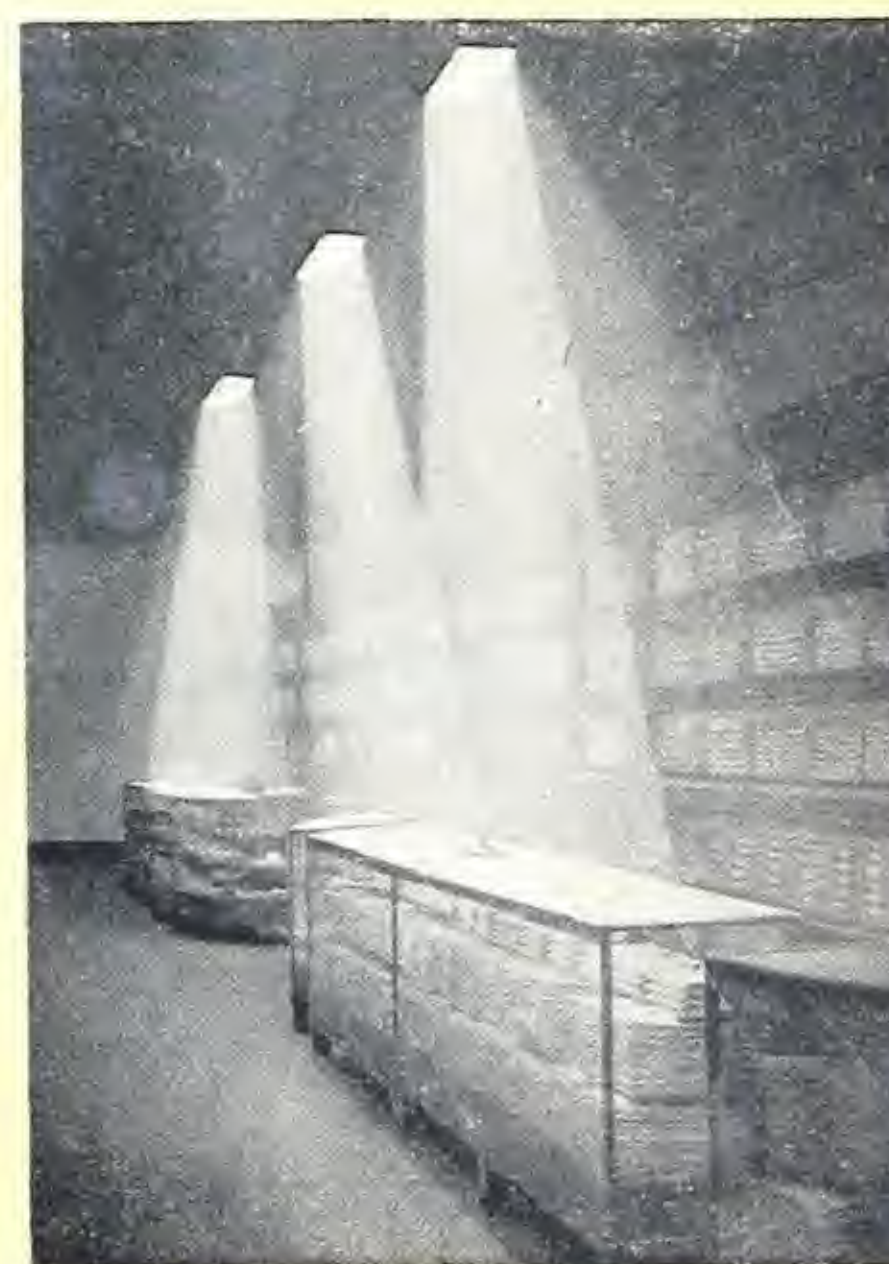
### CATALOGUE DATA

Cat. No.	Size Lamp	Roughing Box			Face Plate		Plaster Opening		Weight Lbs.
		Length	Width	Depth	Length	Width	Length	Width	
F-814	300*	13 3/4"	13 3/4"	7"	15 3/8"	15 3/8"	14 1/2"	14 1/2"	26
E-814	300*	14 1/2"	14 1/2"	18 3/8"	.....	.....	.....	.....	24

\*300 watt medium base lamp—6" Light Centre.



**COUNTERLITE**  
FOR SURFACE MOUNTING



**EMPHASIS ON DISPLAY**

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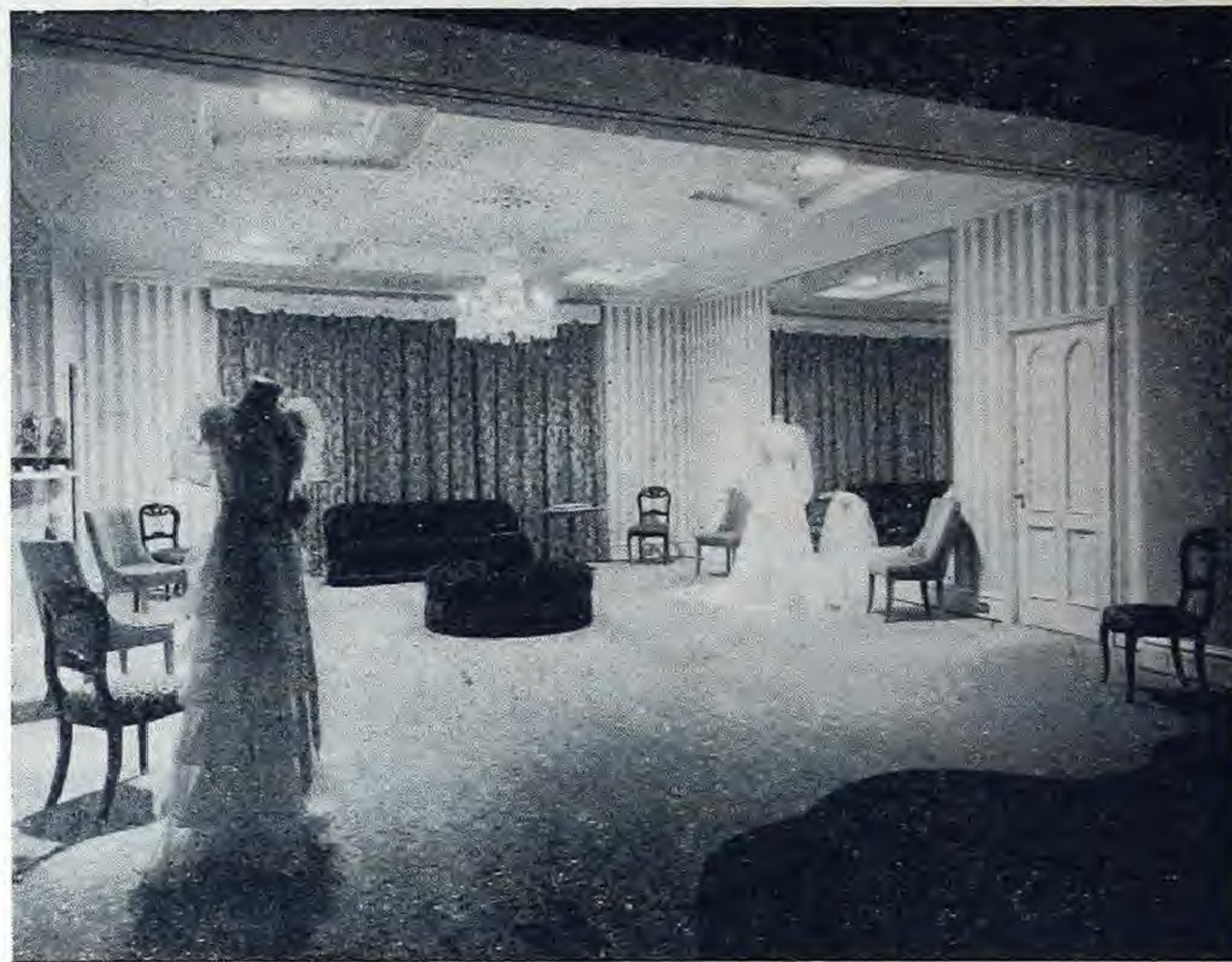
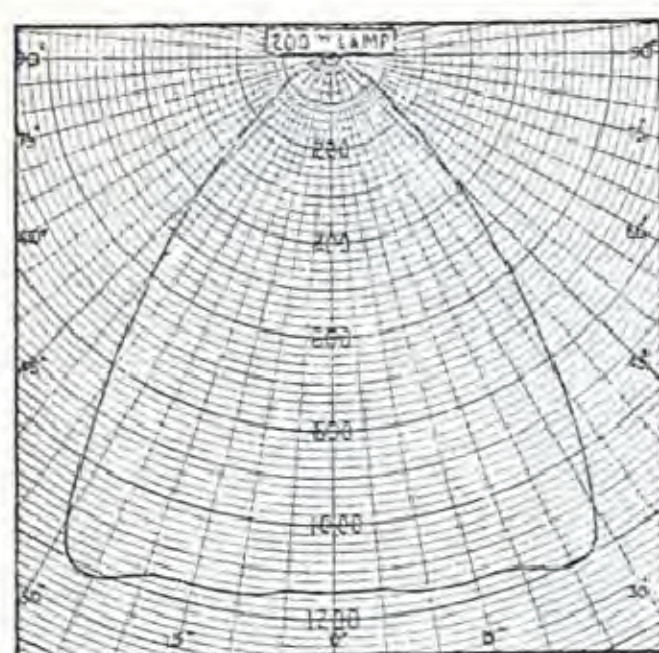
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## Smartness and Complete Satisfaction in Recessed Store Lighting



**R-1894 IN-BILT FLUSH  
TYPE CONTROLENS UNIT**



New design eliminates metal housing to substantially reduce purchase and installation costs. Controlens combined with prismatic reflector gives effective "down light" without glare.

More useful footcandles are developed because light is transmitted and directed without the interference

of fins, louvres, control rings or other mechanical devices resorted to in less efficient equipment.

This unit is best suited for general lighting of stores, studios, banks, etc. As it has an intensive distribution, it should be installed on spacings not exceeding  $1\frac{1}{4}$  times the mounting height.

Catalogue Number	DIMENSIONS			Wattage
	Dia. Face Plate	Dia. Plaster Opening	Recessing Depth	200-300*
<b>R-1894</b>	15½"	15"	12¼"	*6" light centre med. base lamp.

### IN-BILT REFLECTOR-REFRACTORS

For very low ceilings, or higher ceilings with widely spaced outlets, these reflector-refractor units are of the greatest value. They have the power to distribute the illumination widely enough to overcome the handicaps in either condition.

Catalogue No.	Distribution	Lamp Size	Standard Quantity	Shipping Weight
<b>R-2110</b>	Extensive	100	6	36
<b>R-2120</b>	Extensive	150	6	48
<b>R-2130</b>	Extensive	200	6	72
<b>R-2133</b>	Intensive	200	6	72
<b>R-2140</b>	Extensive	300	6	102
<b>R-2143</b>	Intensive	300	6	102





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## Better Light-Better Sales

Scientific planning plus precision design of lighting equipment is the surest and thriftiest way of producing effective store lighting. Holophane Research Engineers understand store lighting. They have studied retail sales activities and have designed lighting equipment specifically for the purpose.

Catalogue Number	Standard Quantity	Quantity Shipping Weight	Diameter Ceiling Ring	Diameter Plaster Opening	Rec. Depth
<b>R-5544</b>	6	148	18 $\frac{1}{4}$ "	17 $\frac{3}{4}$ "	7 $\frac{1}{2}$ "

**WATTAGE:** 200 Watt Mazda  
300 Watt 6" Light Centre Medium Base

Catalogue Number	Standard Quantity	Quantity Shipping Weight	Dimensions		Mazda Lamp
			Diameter	Depth	
<b>C-5540</b>	3	66	15 $\frac{3}{8}$ "	13"	200-300*
<b>S-5540</b>	3	67	15 $\frac{3}{8}$ "	32"	200-300*

\*300 watt, medium base, 6" light centre lamp.

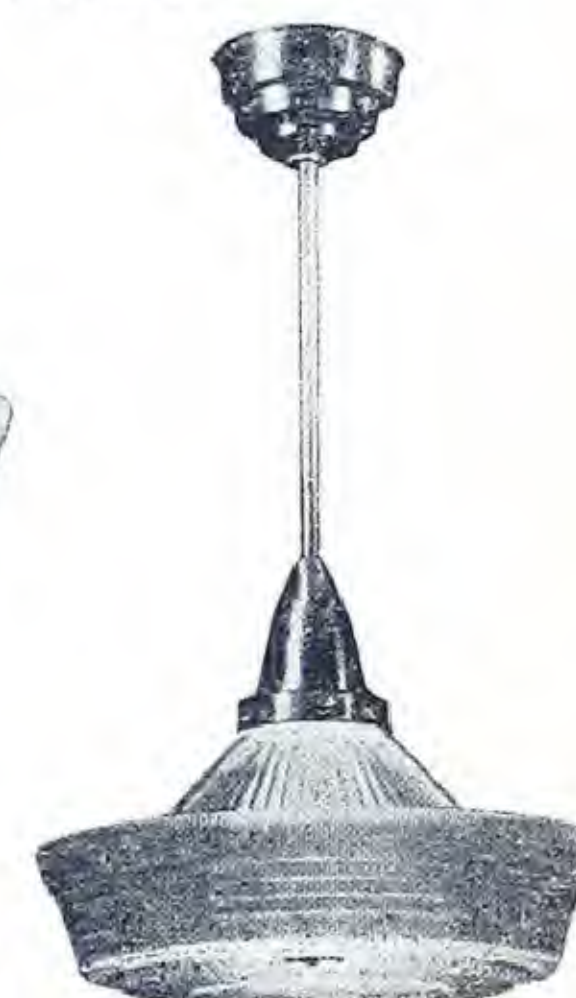


**R-5544 SEMI-RECESSED  
CORRECTALITE**



**No. C-5540**

SURFACE  
MOUNTED  
CORRECTALITES



**No. S-5540**



**CORRECTALITES** are correct and superior in

- *Efficiency*
- *Beauty*
- *Simplicity*
- *Economy*

Recessed Correctalite combines beauty and efficiency. It harmonizes with all types of interiors and with precise re-direction brings greater concentration of illumination on display and sales areas. Space 1 $\frac{1}{4}$  times mounting height.



## Show Window Lighting



The store owner and the display manager have always aimed to achieve the novel, even the ultra modern, in an attractive way—often in their store fronts—but always in their displays. Frequently the lighting is as much an obstacle as an aid to the end in view. If deep shadows do not distort, feather shadows confuse, or, a too complete diffusion robs the setting of all its drama.

In recognition of the ever-varying needs in the many and greatly differing types of windows, we offer reflectors to cover the field.



No. 938

Where built-in lighting is needed for complete concealment of source, there is the special reflector and lens unit No. 938. Especially designed for quality lighting in every way.



No. 936

For all-round fully adaptable window lighting utility with maximum economy and service the No. 936.



Nos. 940 and 916

For built-in lighting with a concentrated distribution appropriate to high windows, the Nos. 940 and 916.



No. 963

For high narrow windows, or concentrated accent lighting, the No. 963 is an inexpensive shadeholder reflector.



Nos. 981 and 983

For deeper low windows the No. 981-No. 983 reflectors. Shadeholder type will be found efficient and economical.

**ALL OF THESE MOST EFFICIENT HOLOPHANE REFLECTORS ARE IMMEDIATELY AVAILABLE**

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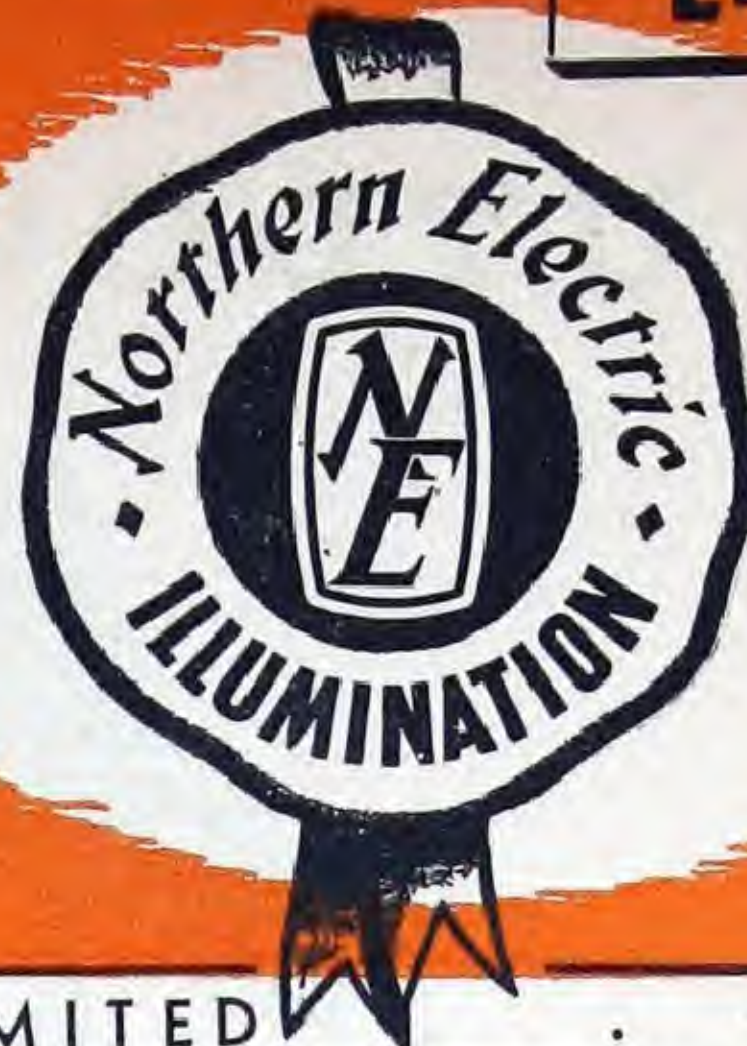
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# Nor-Lectric BULLETIN

September 1944

L-6-1



ED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

## FLOODLIGHTS and DISPLAY SPOTS



**Cat. No. 420**  
For 100-watt or 150-watt Lamp

### INDOOR DISPLAY SPOTS



**Cat. No. 421**  
For 200-watt Lamp

Display-Spots are indoor spotlights, primarily designed for show window lighting, but have many other applications, such as the lighting of display pieces in stores and similar objects.

They have a metal reflector, equipped with porcelain receptacle, and provided with a combination adjustable base and bracket, designed to permit the unit to stand on or fasten to flat surfaces. They can be placed on the floor or mounted on the ceiling

or side wall and adjusted for directing the light from any desired angle.

Finished outside in satin brown, and the inside of the reflector is oxidized aluminum.

Three gelatine colour discs (green, red and amber), together with six feet of heater cord and an attachment plug, are provided with each Display-Spot.

Catalogue Number	Description	Standard Package	Wgt. Lbs. Std. Pkge.
420	For 100-watt or 150-watt Lamp.....	6	30
421	For 200-watt Lamp.....	6	32

**Individually packed.**

**Lamps not included.**

Colour discs for replacement can be supplied in sets of three: one each of Catalogue No. 420-6 Red, 420-7 Amber, 420-8 Green.

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# OUTDOOR FLOODLIGHTS



Cat. No. 5815  
For 150-200-watt Lamp

This Floodlight fills a definite need for a reasonably priced, sturdy, weatherproof floodlight of sufficient beam strength and beam flexibility to meet the majority of the smaller type of ornamental and utilitarian floodlighting jobs.

**Wide Range in Beam Spreads**—The unit is very effective for both medium and short-range floodlighting, as the width of the beam can be adjusted from 25 degrees minimum to 60 degrees maximum spread. The spread of the beam is controlled by a simple, rugged focusing arrangement—operated by a thumbscrew on the outside of the neck.

**Dust, Weather Sealed Interior**—The interior of the unit is sealed by a heat-resisting stippled glass cover and special gasket—held in place by a metal cover band.

**Specially Designed Reflector**—The body of the floodlight is formed into an efficient reflector which intercepts and utilizes the greatest possible amount of light from the lamp. The inner surfaces are satin finished to produce a permanent, non-tarnishing, efficient reflecting surface.



Cat. No. 5810  
For 75-100-watt Lamp

This Junior Floodlight meets the demand for a low-priced, weather-resisting floodlight for decorative and general purpose lighting.

**Design**—The design of the reflector provides a wide distribution of light, giving relatively wide coverage at short range. For example, a single Junior Floodlight with a 100-watt lamp will effectively and uniformly light an area 11 to 12 feet in diameter, when mounted at a distance of 7 feet from the floodlighted surface.

**Mounting**—Mounting the unit at distances greater than 10 feet is recommended only where the areas surrounding the floodlighted surfaces are in complete darkness.

**Reflector**—The reflector is of symmetrical shape, designed to provide the most effective distribution.

**Cover and Gasket**—The interior of the unit is sealed by a moulded plain glass cover and a special gasket—held in place by a metal retaining band.

## SPECIFICATIONS FOR BOTH 5810, 5815 FLOODLIGHTS

**Finish**—The overall finish of these floodlights is dark olive green to harmonize with most surroundings.

**Packing**—Floodlights are individually packed—ready for use.

**Solid Surface Attachment**—For solid surface attachment, the base is provided with two screw slots.

**Extension Cord**—Floodlights are wired and include a six-foot, rubber-covered extension cord with a standard parallel-blade rubber cap.

Catalogue Number	Description	Recommended Lamp Size	Standard Package	Wgt. Lbs. Std. Pkge.
5810	Floodlight, Base, Cord and Plug.....	100 Watt	1	4½
5815	Floodlight, Base, Cord and Plug.....	150-200 Watt	1	6

Replacement lenses for Floodlights Catalogue Nos. 5810 and 5815 may be obtained at small cost.

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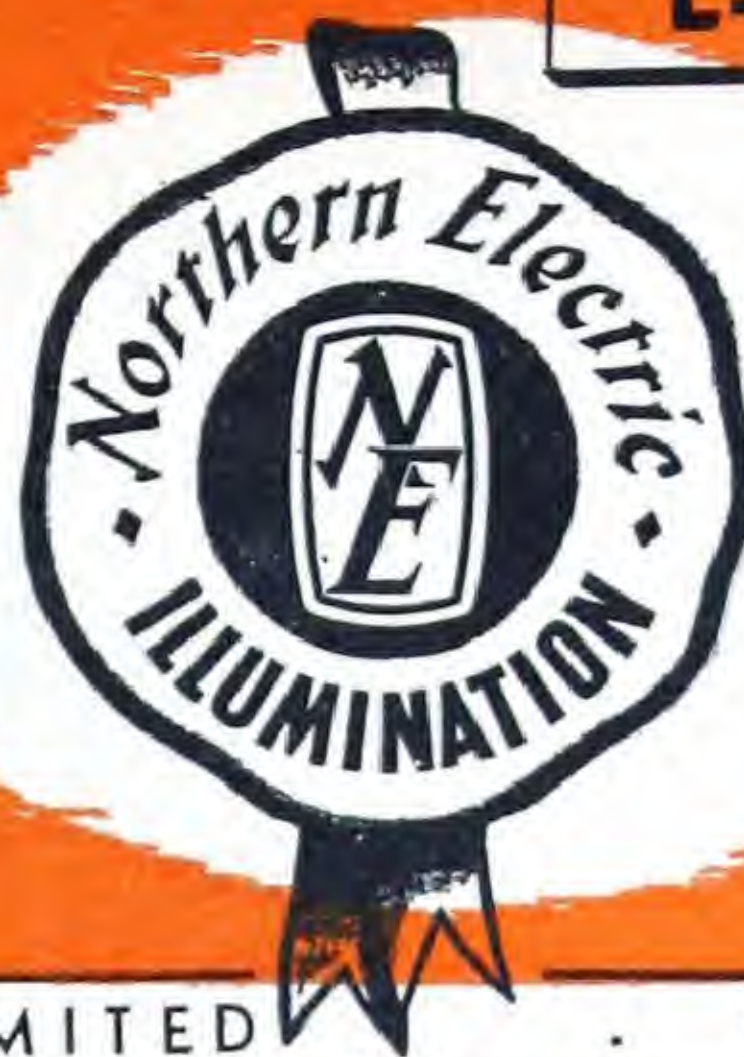
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# Nor-Lectric BULLETIN

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ISHED BY NORTHERN ELECTRIC COMPANY LIMITED . 1944

## FLOODLIGHTS and DISPLAY SPOTS



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**For 100-watt or 150-watt Lamp**

Display-Spots are indoor spotlights, primarily designed for show window lighting, but have many other applications, such as the lighting of display pieces in stores and similar objects.

They have a metal reflector, equipped with porcelain receptacle, and provided with a combination adjustable base and bracket, designed to permit the unit to stand on or fasten to flat surfaces. They can be placed on the floor or mounted on the ceiling

### INDOOR DISPLAY SPOTS



**Cat. No. 421**  
**For 200-watt Lamp**

or side wall and adjusted for directing the light from any desired angle.

Finished outside in satin brown, and the inside of the reflector is oxidized aluminum.

Three gelatine colour discs (green, red and amber), together with six feet of heater cord and an attachment plug, are provided with each Display-Spot.

Catalogue Number	Description	Standard Package	Wgt. Lbs. Std. Pkgs.
420	For 100-watt or 150-watt Lamp.....	6	30
421	For 200-watt Lamp.....	6	32

**Individually packed.**

**Lamps not included.**

**Colour discs for replacement can be supplied in sets of three: one each of Catalogue No. 420-6 Red, 420-7 Amber, 420-8 Green.**

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# OUTDOOR FLOODLIGHTS



**Cat. No. 5815**  
**For 150-200-watt Lamp**

This Floodlight fills a definite need for a reasonably priced, sturdy, weatherproof floodlight of sufficient beam strength and beam flexibility to meet the majority of the smaller type of ornamental and utilitarian floodlighting jobs.

**Wide Range in Beam Spreads**—The unit is very effective for both medium and short-range floodlighting, as the width of the beam can be adjusted from 25 degrees minimum to 60 degrees maximum spread. The spread of the beam is controlled by a simple, rugged focusing arrangement—operated by a thumbscrew on the outside of the neck.

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**Specially Designed Reflector**—The body of the floodlight is formed into an efficient reflector which intercepts and utilizes the greatest possible amount of light from the lamp. The inner surfaces are satin finished to produce a permanent, non-tarnishing, efficient reflecting surface.



**Cat. No. 5810**  
**For 75-100-watt Lamp**

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**Design**—The design of the reflector provides a wide distribution of light, giving relatively wide coverage at short range. For example, a single Junior Floodlight with a 100-watt lamp will effectively and uniformly light an area 11 to 12 feet in diameter, when mounted at a distance of 7 feet from the floodlighted surface.

**Mounting**—Mounting the unit at distances greater than 10 feet is recommended only where the areas surrounding the floodlighted surfaces are in complete darkness.

**Reflector**—The reflector is of symmetrical shape, designed to provide the most effective distribution.

**Cover and Gasket**—The interior of the unit is sealed by a moulded plain glass cover and a special gasket—held in place by a metal retaining band.

## SPECIFICATIONS FOR BOTH 5810, 5815 FLOODLIGHTS

**Finish**—The overall finish of these floodlights is dark olive green to harmonize with most surroundings.

**Packing**—Floodlights are individually packed—ready for use.

**Solid Surface Attachment**—For solid surface attachment, the base is provided with two screw slots.

**Extension Cord**—Floodlights are wired and include a six-foot, rubber-covered extension cord with a standard parallel-blade rubber cap.

Catalogue Number	Description	Recommended Lamp Size	Standard Package	Wgt. Lbs. Std. Pkge.
5810	Floodlight, Base, Cord and Plug.....	100 Watt	1	4½
5815	Floodlight, Base, Cord and Plug.....	150-200 Watt	1	6

Replacement lenses for Floodlights Catalogue Nos. 5810 and 5815 may be obtained at small cost.

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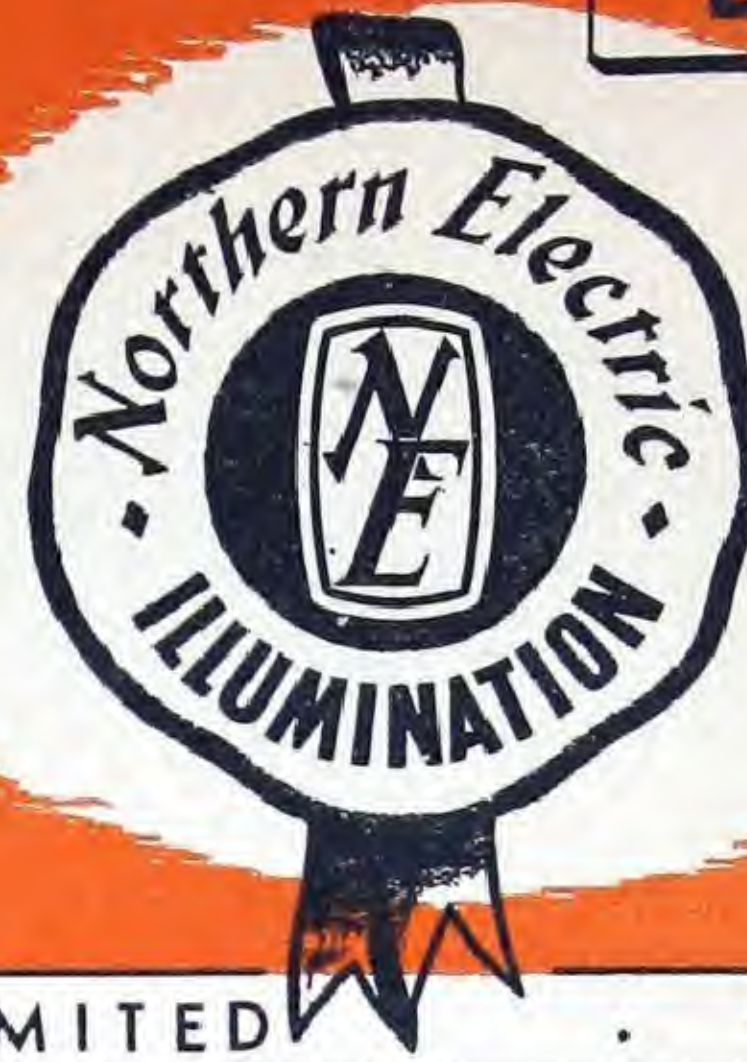
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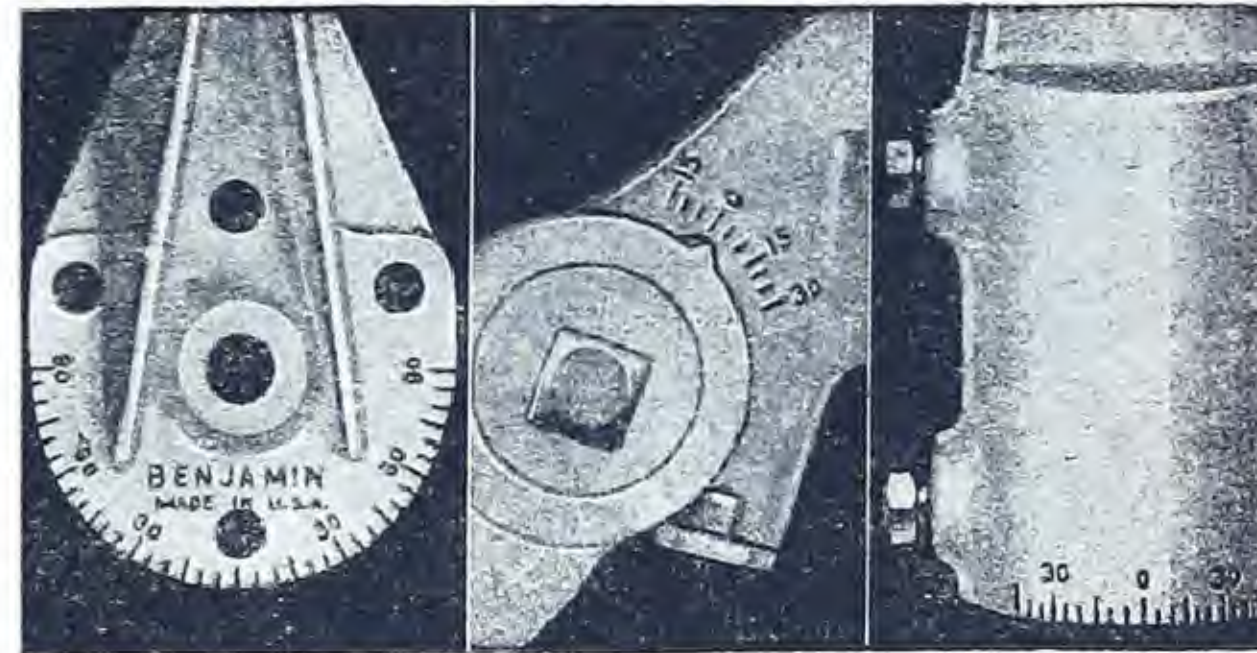


# BULLETIN



ISHED BY NORTHERN ELECTRIC COMPANY LIMITED . 1944

## "Ellipto-Lite Play-Area" Floodlights



The degree markings on the horizontal and vertical adjustments make possible pre-setting of floodlights within close limits at time of installation.

New, low-priced, wide-angle, open-type floodlights, combining porcelain enameled steel diffusing reflectors of elliptical shape with inner auxiliary reflectors of Alzak oxidized aluminum, and particularly suited for floodlighting outdoor sports areas, playgrounds and parking lots.

### SIMPLE, RUGGED AND QUICK-ACTING REMOVABLE HOOD CONSTRUCTION

The unique removable hood construction of these floodlights makes it possible to remove the reflector for easy

cleaning on the ground without disturbing the socket, wiring or position of the mounting bracket.

A flange on the neck of the reflector is slotted to match slots cut in a collar on the hood. Thus the reflector can be attached or detached from the hood at only one position, yet it is supported at all other positions by the collar. The reflector can be rotated in the hood, giving a wide range of horizontal adjustment and locked at any desired position by means of a set-screw in the hood.

### EASY TO WIRE AND INSTALL

This construction makes for ease and time savings in wiring and installation as well as maintenance. Wiring terminals of the skeleton-type mogul receptacle are large and unusually accessible due to the shallowness of the removable hood. When desired, hood and bracket can be wired and attached before reflector.

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# Benjamin "Ellipto-Lite Play-Area" Floodlights

## FOUR TYPES OF HOODS AVAILABLE

Hoods are available in four types for various methods of attachment: (1) pendent for threading directly to an iron pipe; (2) closed-wiring, slip-fitter bracket for fitting over the end of a 1½-inch iron pipe, also available for 2-inch pipe; (3) open-wiring, cross arm bracket for attaching to wood cross arms or other flat surfaces; (4) cross arm complete with pipe clamp for clamping around 1 to 2-inch iron pipe.



Pendent Hood



Cross Arm Bracket with Pipe Clamp



Slip-fitter Bracket

## FLOODLIGHTS COMPLETE WITH PENDENT HOODS

Hoods tapped ¾-inch standard; 1-inch, if specified, at no advance in price.

Catalogue Number		Size of Lamp Watts	Dimensions, Inches			Shipping Weight Pounds, Each
With Inner Reflector	Less Inner Reflector		"A"	"B"	"C"	
5970	5973	750-1500	14¾	21⅞	22¾	24

## FLOODLIGHTS COMPLETE WITH CROSS ARM BRACKET

Bracket fits standard 4¼-inch arms and any flat surface.

5971	5974	750-1500	14¾	21⅞	21¾	26
------	------	----------	-----	-----	-----	----

## FLOODLIGHTS COMPLETE WITH BRACKET PIPE CLAMP

Bracket clamps around 1 to 2-inch iron pipe.

5977	5978	750-1500	14¾	21⅞	21¾	25
------	------	----------	-----	-----	-----	----

## FLOODLIGHTS COMPLETE WITH SLIP-FITTER BRACKET

Brackets slip on 1½-inch I.P. mast; numbers suffixed "A", 2-inch.

5975	5976	750-1500	14¾	21⅞	21¾	28
5975A	5976-A	750-1500	14¾	21⅞	21¾	28

**For Bi-post Lamps**—Floodlights can be supplied with holders for 1000-watt, medium Bi-post, hard-glass lamps. To order, prefix catalogue numbers with "BP."



**FOOTBALL FIELD**—Illumination of this field is produced by 52 Benjamin Ellipto-Lite Floodlights—Catalogue No. 5971.



## Benjamin "Ellipto-Lite Play-Area" Floodlights



**BASEBALL DIAMOND**—Illumination of this diamond is produced by 160 Cat. No. 5971 Ellipto-Lite Floodlights, using 1500-watt Lamps.

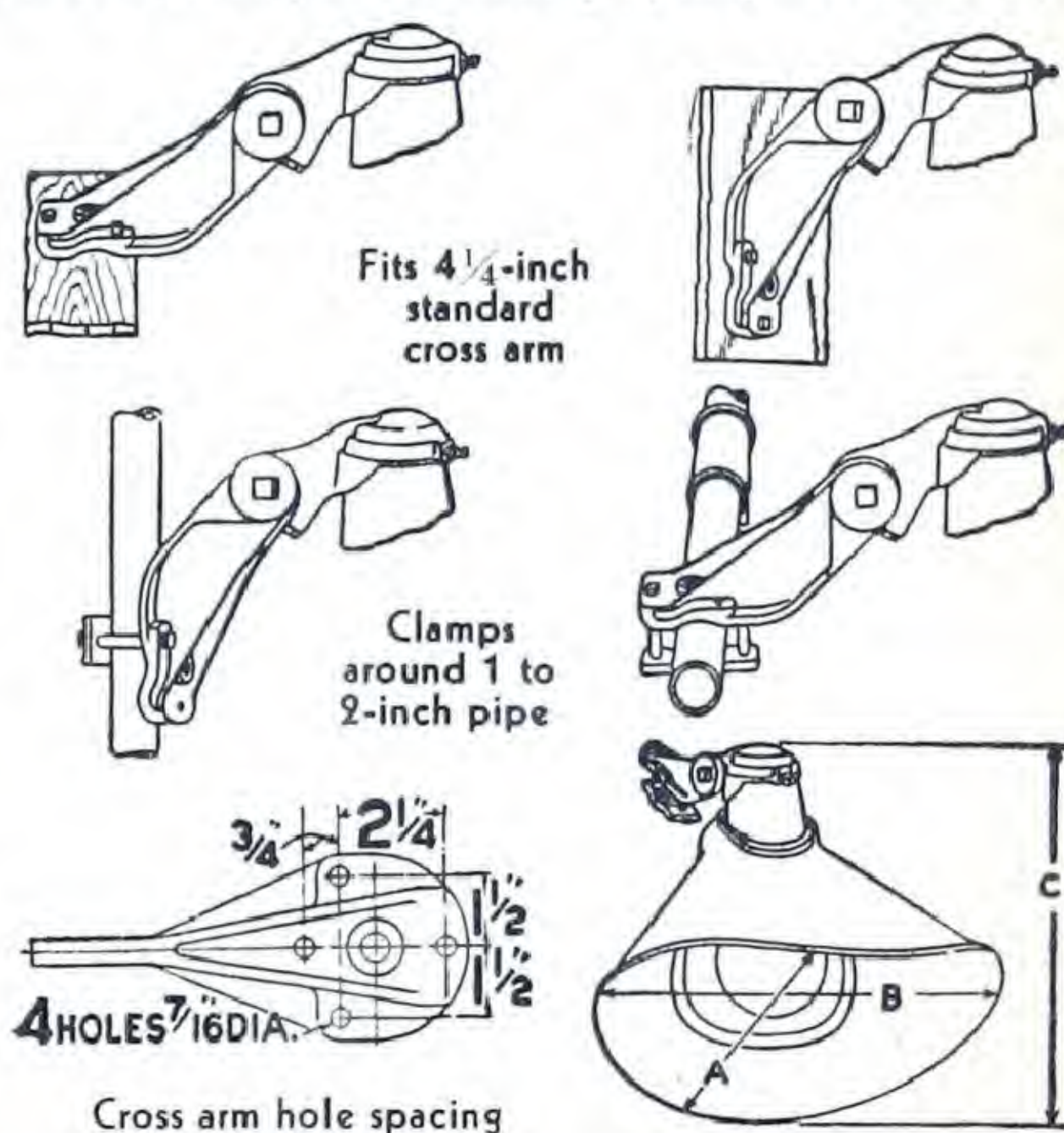
**REFLECTORS**—Porcelain enamel steel, elliptical shape, white inside, green outside; red, when specified, at same price. Reflecting surfaces of special diffusing enamel to reduce glare.

**INNER REFLECTORS**—Alzak oxidized aluminum; No. 1970 (750-1500-watt).

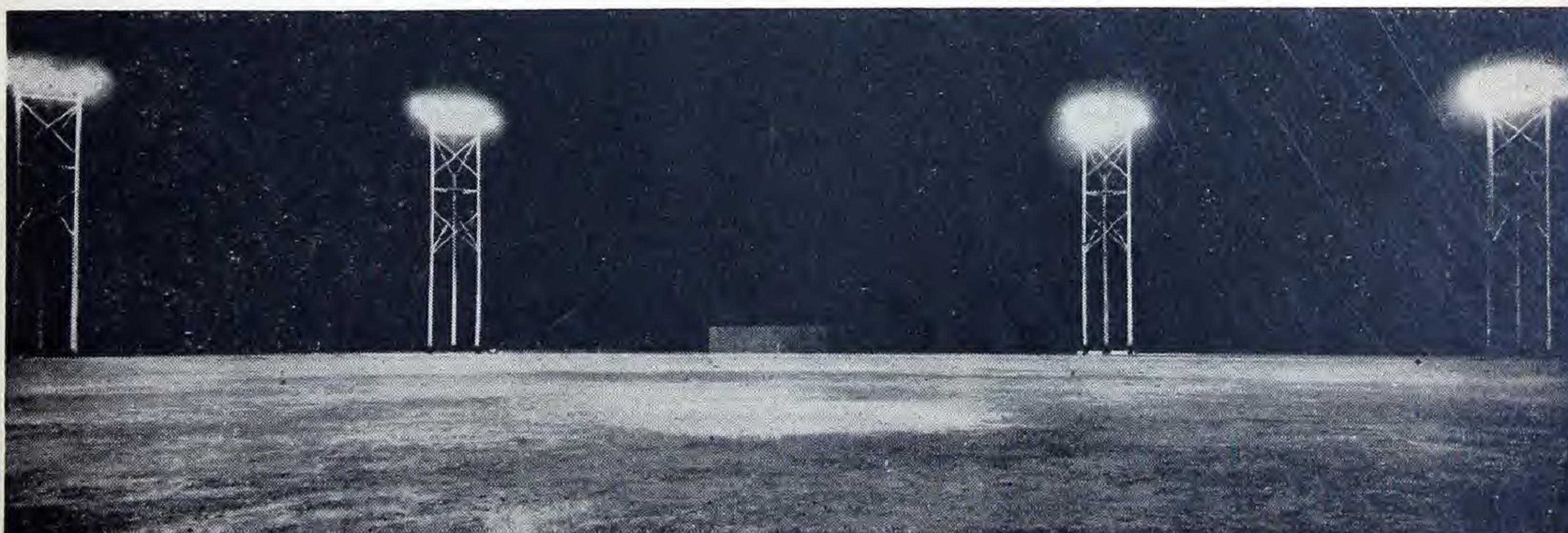
**RECEPTACLE**—Skeleton-type, mogul base, with "finger" lamp grip.

**WIRE**—Cross arm units supplied with a 26-inch length of No. 14 two-conductor AFS rubber-covered cable; slip-fitter units have two 31-inch lengths of No. 14 solid AF wire.

**HOODS AND BRACKETS**—Pendent hood is tapped  $\frac{3}{4}$ -inch standard; 1-inch when specified. Cross arm bracket fits standard  $4\frac{1}{4}$ -inch cross arms. Nos. 5777, 5779 and 5977, 5978 have pipe clamp to fit 1 to 2-inch iron pipe. Slip-fitter brackets available to fit  $1\frac{1}{2}$  or 2-inch iron pipe masts. Fittings which are not aluminum, are electro-plated.



Cross arm hole spacing



**ATHLETIC FIELD**—Illumination consists of 120 Benjamin Floodlights mounted on 8 special towers.

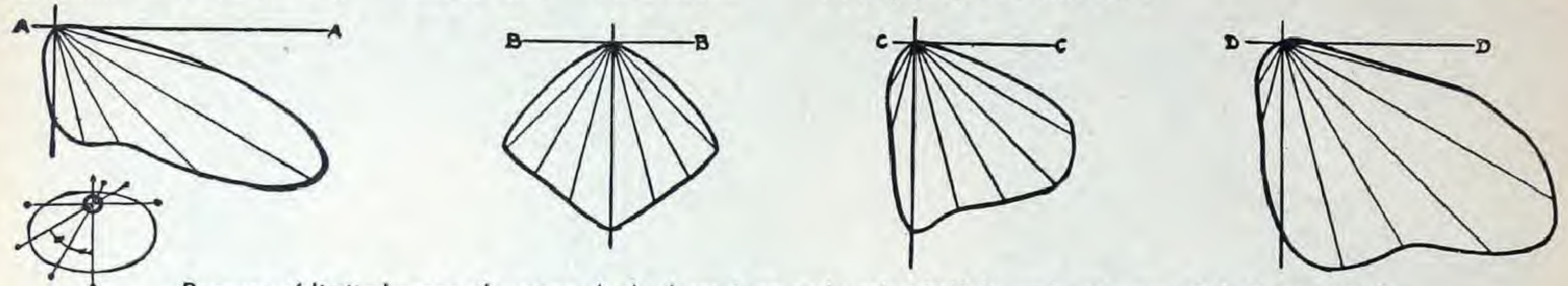


# BENJAMIN 750-1500-WATT "ELLIPTO-LITE" FLOODLIGHT

## Lighting Characteristics

Below are candlepower distribution curves of the Benjamin 750-1500-watt "Ellipto-Lite" Floodlight.

These curves are through perpendicular planes marked A-A, B-B, C-C and D-D.

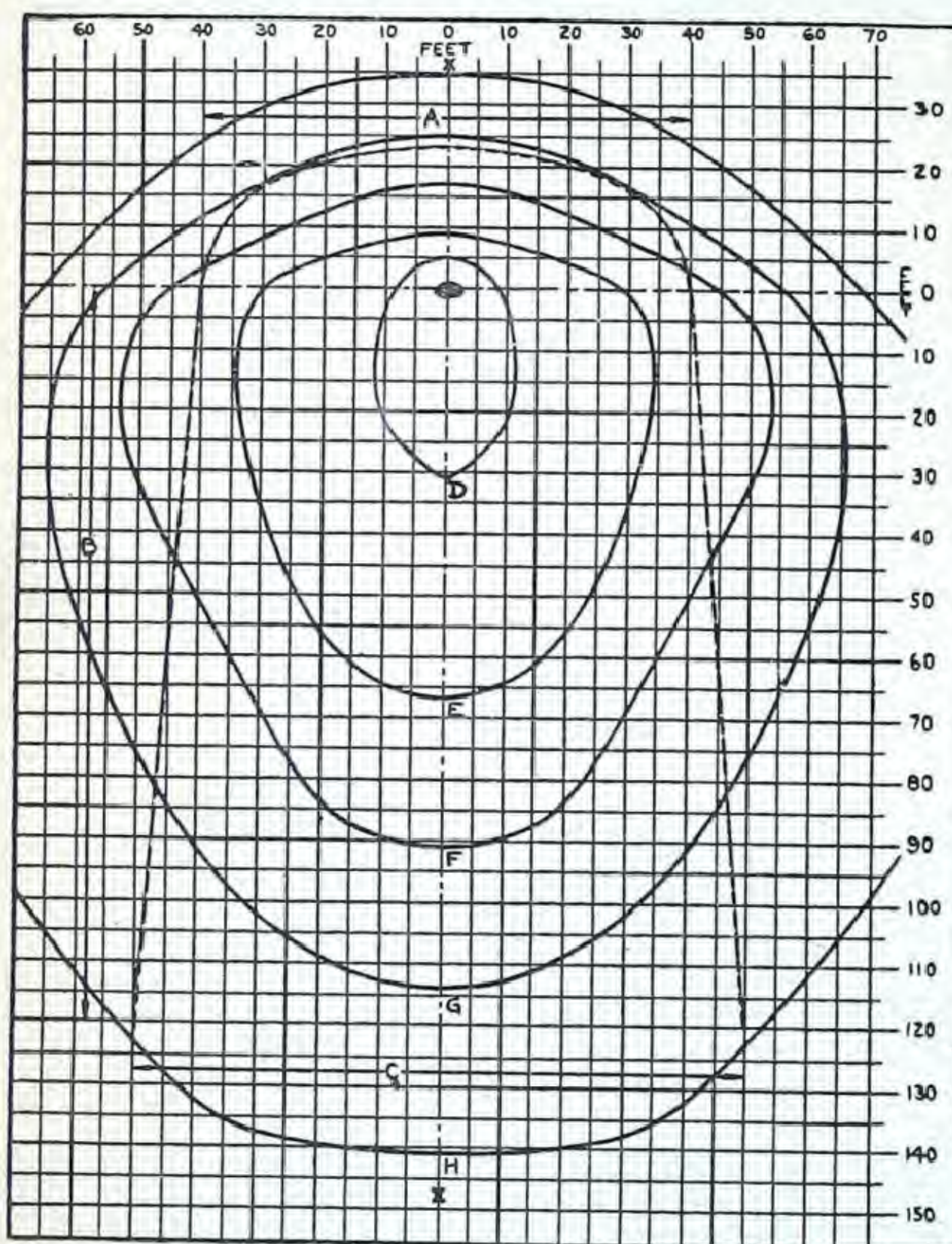


Because of limited space, the curve A-A above is reproduced at half the scale of curves B-B, C-C and D-D.

## Data on Coverage of a Single Unit

The accompanying data on the coverage of a single floodlight will be found valuable in forming the basis for determining the locations where units should be mounted to obtain uniform illumination, adequate coverage and freedom from shadows.

## DIAGRAM 1—Coverage of One Unit



NOTE—The dotted line and curves in the diagram above indicate the area effectively covered by a single unit mounted at a height of 40 feet, with the lamp in a vertical position. For the areas effectively illuminated at other mounting heights, refer to Table 1 for dimensions "A", "B" and "C".

†Values based on 14,550 lumens for 750-watt, 20,000 for 1000-watt and 33,000 for 1500-watt lamps.

TABLE 1—AREA EFFECTIVELY LIGHTED

Mounting Height	"A"	"B"	"C"
20 Feet	40'	60'	50'
25 Feet	50'	75'	60'
30 Feet	60'	90'	75'
35 Feet	70'	105'	85'
40 Feet	80'	120'	100'
50 Feet	100'	150'	125'

NOTE—It will be seen, from the area of effective illumination shown in Diagram 1, that the spacing distance between units should never be more than twice the mounting height.

TABLE 2—FOOT CANDLES ON HORIZONTAL†

Mounting Height	Lamp Watts	"D"	"E"	"F"	"G"	"H"
*20 Feet	750	3.1	.36	.1	.03	
	1000	4.3	.5	.14	.04	
	1500	6.9	.8	.23	.06	
*25 Feet	750	2.8	.5	.22	.06	.02
	1000	3.9	.7	.3	.09	.03
	1500	6.2	1.1	.48	.15	.05
*30 Feet	750	2.3	.65	.28	.1	.04
	1000	3.1	.9	.38	.14	.05
	1500	5.0	1.5	.61	.23	.08
*35 Feet	750	1.8	.7	.33	.14	.06
	1000	2.5	1	.46	.2	.09
	1500	4.0	1.6	.74	.32	.15
40 Feet	750	1.4	.7	.36	.18	.07
	1000	2	1	.5	.25	.1
	1500	3.2	1.6	.8	.4	.16
*50 Feet	750	.94	.7	.41	.23	.09
	1000	1.3	.94	.57	.32	.12
	1500	2.1	1.5	.91	.51	.19

\*NOTE—Intensities for these mounting heights are for points on the line X-X only, as shown in Diagram 1. Foot candle values in the above table are for one unit only.

# Northern Electric

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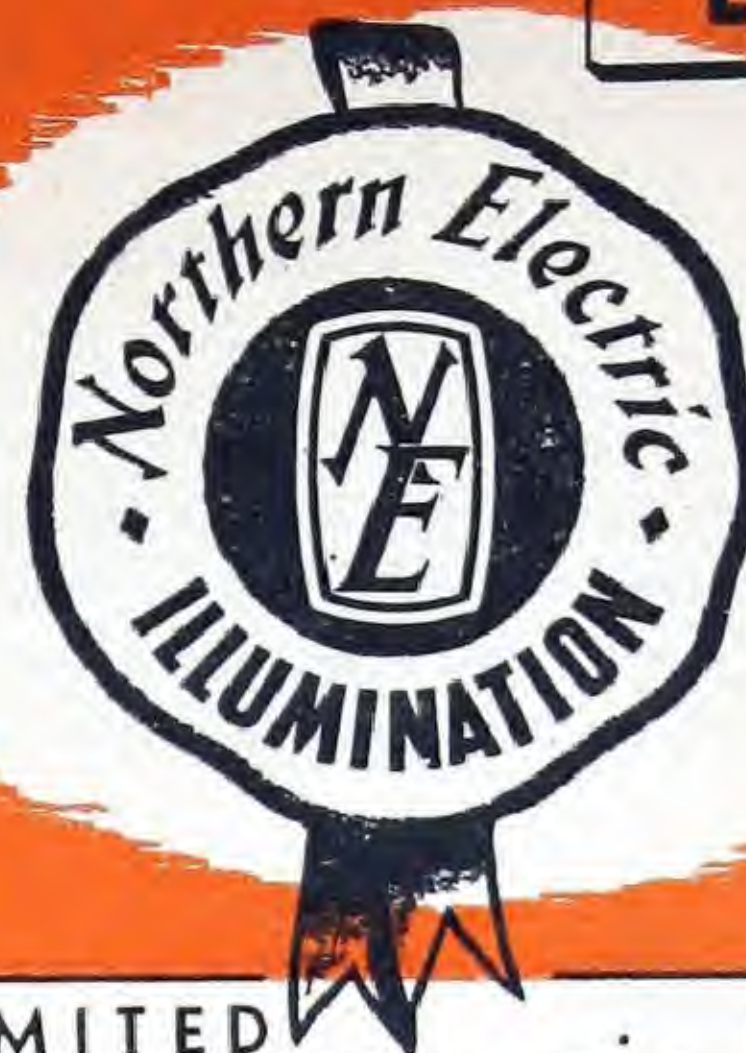
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# Nor-Lectric BULLETIN

December 1944

L-6-2



ISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

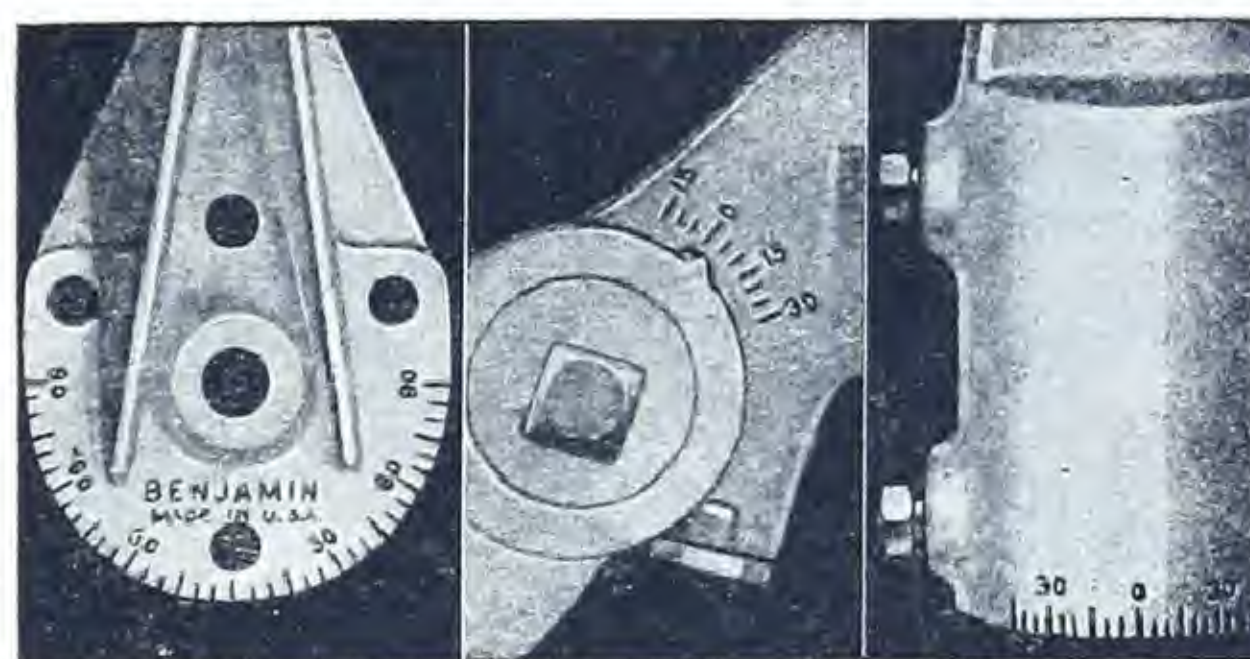
## "Ellipto-Lite Play-Area" Floodlights



New, low-priced, wide-angle, open-type floodlights, combining porcelain enameled steel diffusing reflectors of elliptical shape with inner auxiliary reflectors of Alzak oxidized aluminum, and particularly suited for floodlighting outdoor sports areas, playgrounds and parking lots.

### SIMPLE, RUGGED AND QUICK-ACTING REMOVABLE HOOD CONSTRUCTION

The unique removable hood construction of these floodlights makes it possible to remove the reflector for easy



The degree markings on the horizontal and vertical adjustments make possible pre-setting of floodlights within close limits at time of installation.

cleaning on the ground without disturbing the socket, wiring or position of the mounting bracket.

A flange on the neck of the reflector is slotted to match slots cut in a collar on the hood. Thus the reflector can be attached or detached from the hood at only one position, yet it is supported at all other positions by the collar. The reflector can be rotated in the hood, giving a wide range of horizontal adjustment and locked at any desired position by means of a set-screw in the hood.

### EASY TO WIRE AND INSTALL

This construction makes for ease and time savings in wiring and installation as well as maintenance. Wiring terminals of the skeleton-type mogul receptacle are large and unusually accessible due to the shallowness of the removable hood. When desired, hood and bracket can be wired and attached before reflector.

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## Benjamin "Ellipto-Lite Play-Area" Floodlights

### FOUR TYPES OF HOODS AVAILABLE

Hoods are available in four types for various methods of attachment: (1) pendent for threading directly to an iron pipe; (2) closed-wiring, slip-fitter bracket for fitting over the end of a 1½-inch iron pipe, also available for 2-inch pipe; (3) open-wiring, cross arm bracket for attaching to wood cross arms or other flat surfaces; (4) cross arm complete with pipe clamp for clamping around 1 to 2-inch iron pipe.



Pendent Hood



Cross Arm Bracket  
with Pipe Clamp



Slip-fitter Bracket

### FLOODLIGHTS COMPLETE WITH PENDENT HOODS

Hoods tapped ¾-inch standard; 1-inch, if specified, at no advance in price.

Catalogue Number		Size of Lamp Watts	Dimensions, Inches			Shipping Weight Pounds, Each
With Inner Reflector	Less Inner Reflector		"A"	"B"	"C"	
5970	5973	750-1500	14¾	21⅞	22¾	24

### FLOODLIGHTS COMPLETE WITH CROSS ARM BRACKET

Bracket fits standard 4¼-inch arms and any flat surface.

5971	5974	750-1500	14¾	21⅞	21¾	26
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### FLOODLIGHTS COMPLETE WITH BRACKET PIPE CLAMP

Bracket clamps around 1 to 2-inch iron pipe.

5977	5978	750-1500	14¾	21⅞	21¾	25
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### FLOODLIGHTS COMPLETE WITH SLIP-FITTER BRACKET

Brackets slip on 1½-inch I.P. mast; numbers suffixed "A", 2-inch.

5975	5976	750-1500	14¾	21⅞	21¾	28
5975A	5976-A	750-1500	14¾	21⅞	21¾	28

**For Bi-post Lamps**—Floodlights can be supplied with holders for 1000-watt, medium Bi-post, hard-glass lamps. To order, prefix catalogue numbers with "BP."



**FOOTBALL FIELD**—Illumination of this field is produced by 52 Benjamin Ellipto-Lite Floodlights—Catalogue No. 5971.



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## Benjamin "Ellipto-Lite Play-Area" Floodlights



**BASEBALL DIAMOND**—Illumination of this diamond is produced by 160 Cat. No. 5971 Ellipto-Lite Floodlights, using 1500-watt Lamps.

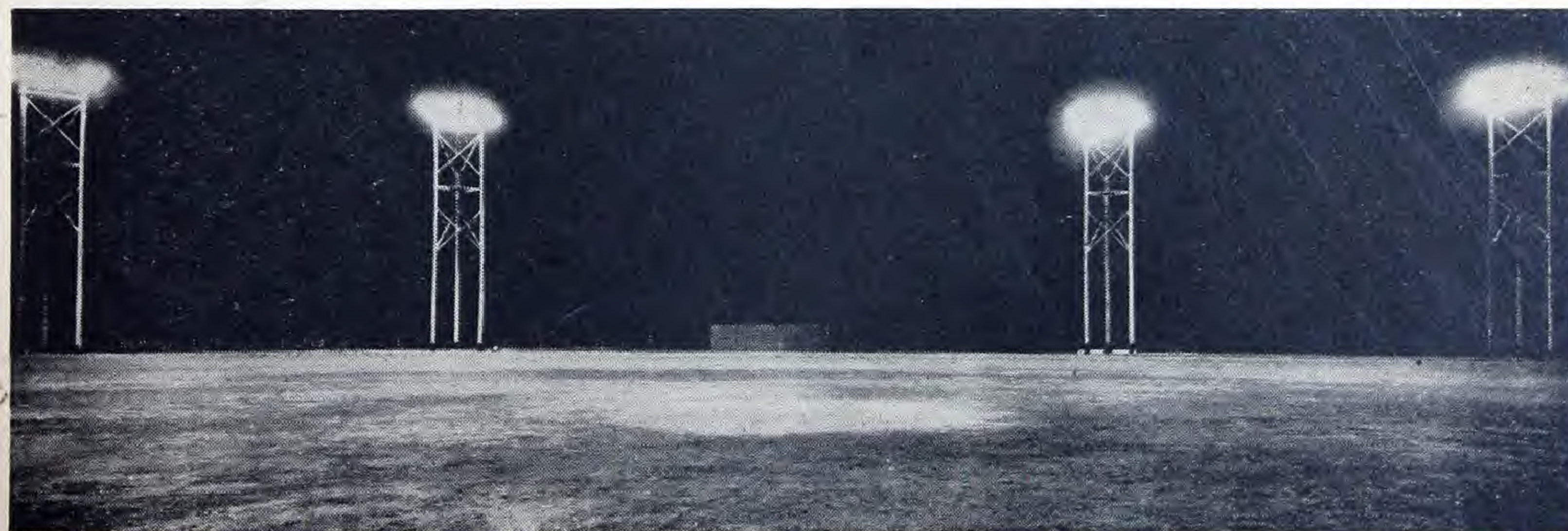
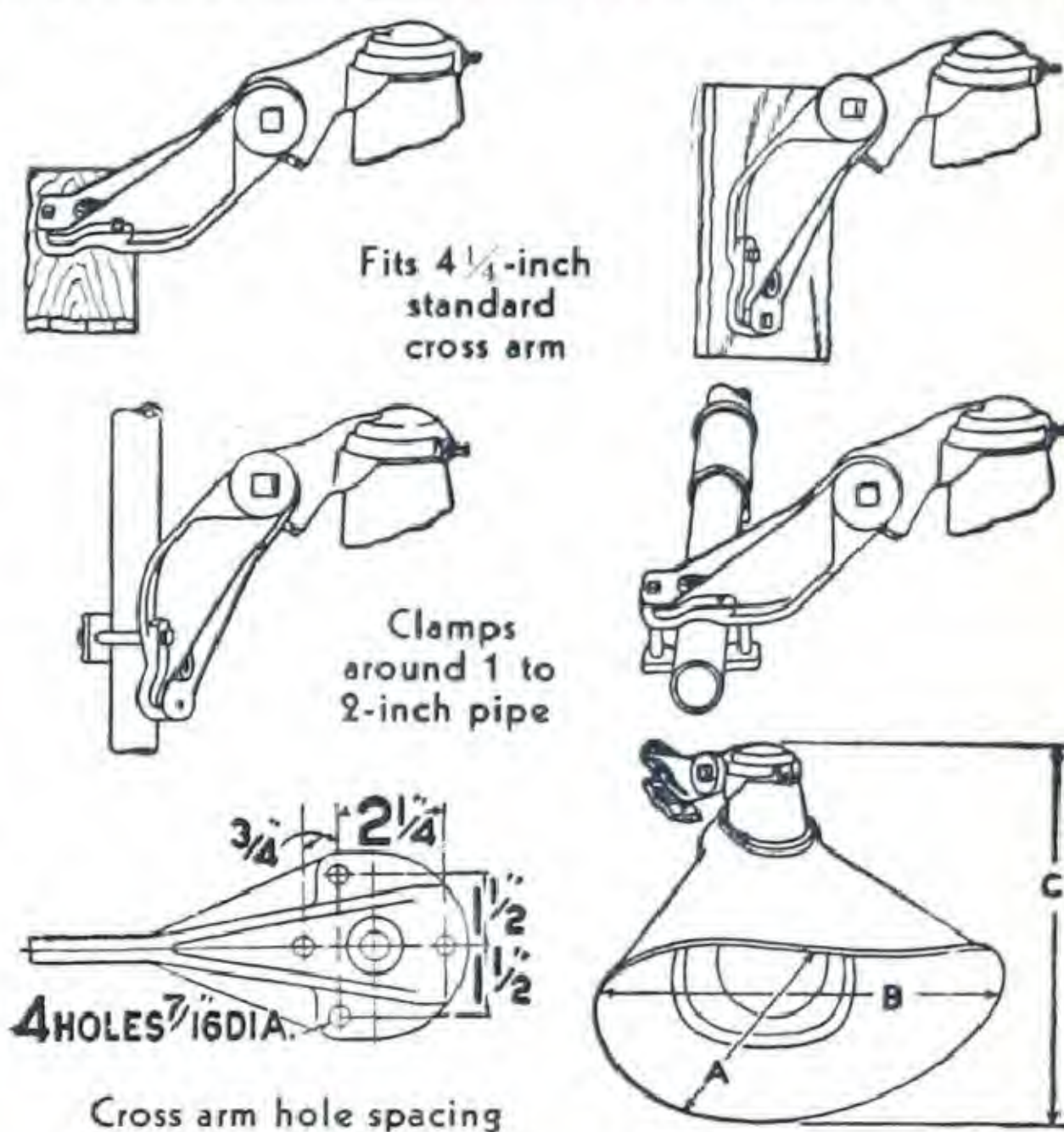
**REFLECTORS**—Porcelain enamel steel, elliptical shape, white inside, green outside; red, when specified, at same price. Reflecting surfaces of special diffusing enamel to reduce glare.

**INNER REFLECTORS**—Alzak oxidized aluminum; No. 1970 (750-1500-watt).

**RECEPTACLE**—Skeleton-type, mogul base, with "finger" lamp grip.

**WIRE**—Cross arm units supplied with a 26-inch length of No. 14 two-conductor AFS rubber-covered cable; slip-fitter units have two 31-inch lengths of No. 14 solid AF wire.

**HOODS AND BRACKETS**—Pendent hood is tapped  $\frac{3}{4}$ -inch standard; 1-inch when specified. Cross arm bracket fits standard  $4\frac{1}{4}$ -inch cross arms. Nos. 5777, 5779 and 5977, 5978 have pipe clamp to fit 1 to 2-inch iron pipe. Slip-fitter brackets available to fit  $1\frac{1}{2}$  or 2-inch iron pipe masts. Fittings which are not aluminum, are electro-plated.



**ATHLETIC FIELD**—Illumination consists of 120 Benjamin Floodlights mounted on 8 special towers.

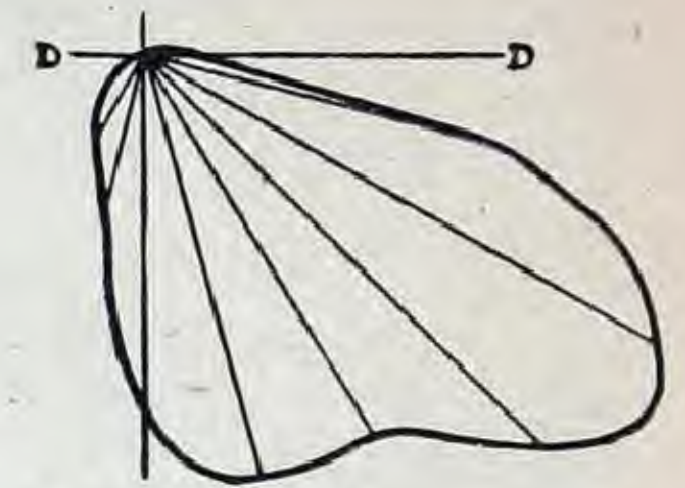
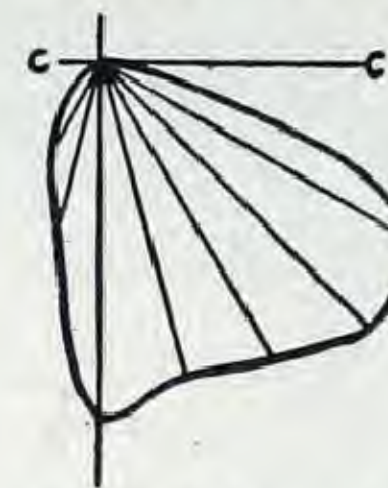
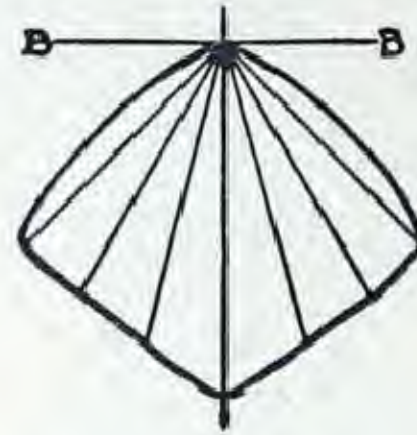
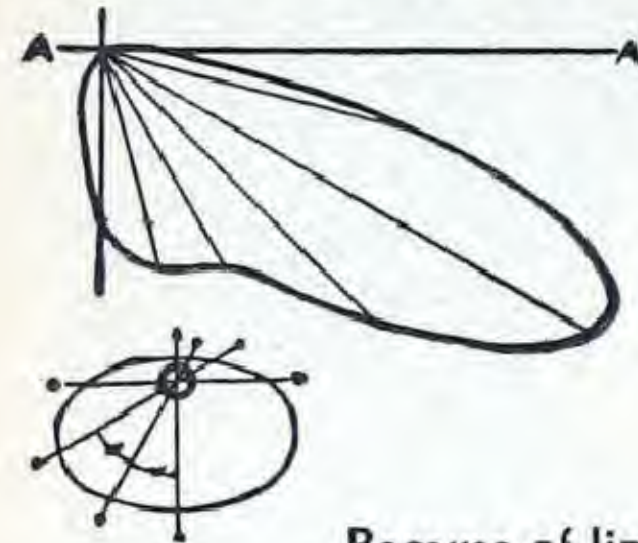


# BENJAMIN 750-1500-WATT "ELLIPTO-LITE" FLOODLIGHT

## Lighting Characteristics

Below are candlepower distribution curves of the Benjamin 750-1500-watt "Ellipto-Lite" Floodlight.

These curves are through perpendicular planes marked A-A, B-B, C-C and D-D.

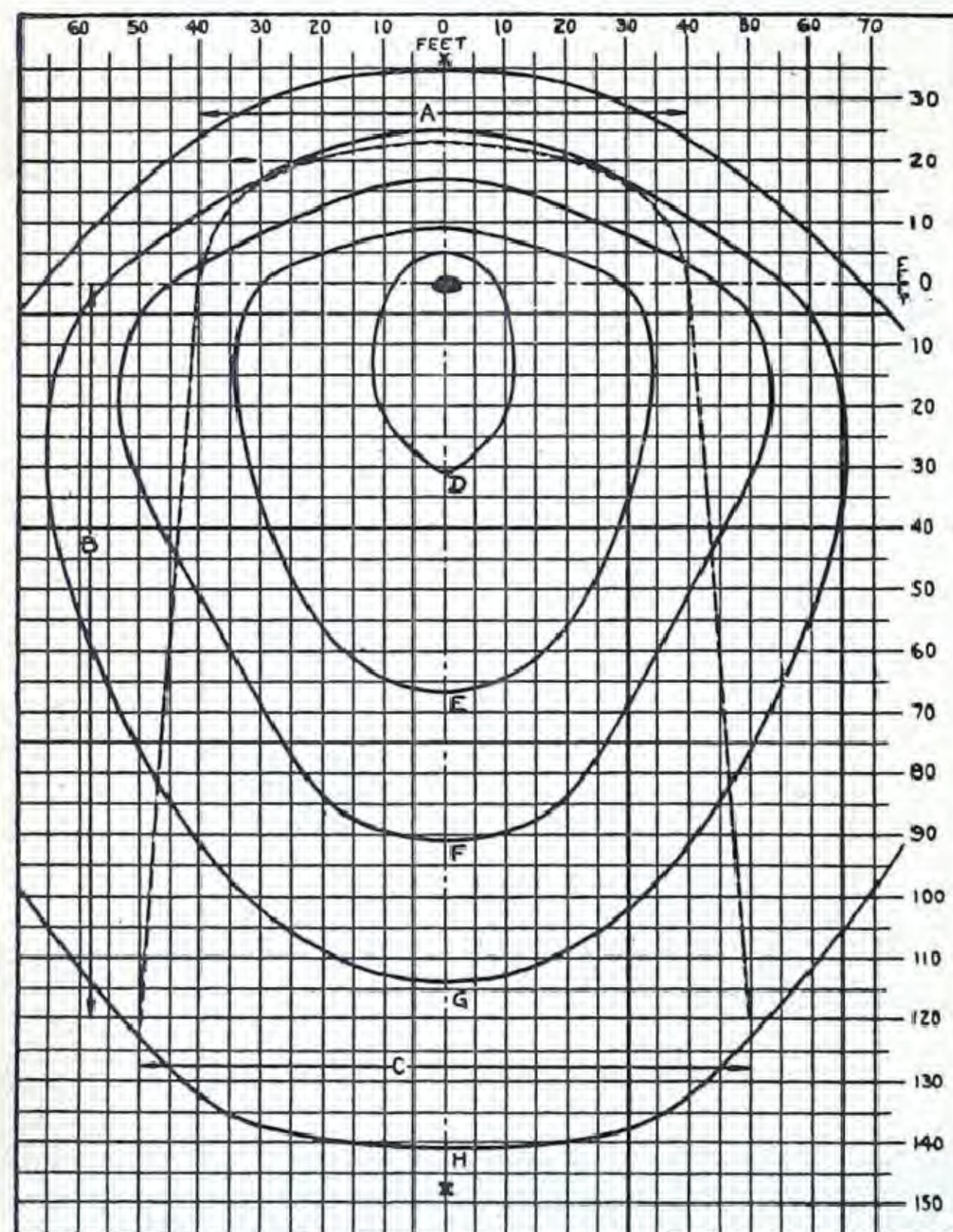


Because of limited space, the curve A-A above is reproduced at half the scale of curves B-B, C-C and D-D.

## Data on Coverage of a Single Unit

The accompanying data on the coverage of a single floodlight will be found valuable in forming the basis for determining the locations where units should be mounted to obtain uniform illumination, adequate coverage and freedom from shadows.

DIAGRAM 1—Coverage of One Unit



NOTE—The dotted line and curves in the diagram above indicate the area effectively covered by a single unit mounted at a height of 40 feet, with the lamp in a vertical position. For the areas effectively illuminated at other mounting heights, refer to Table 1 for dimensions "A", "B" and "C".

†Values based on 14,550 lumens for 750-watt, 20,000 for 1000-watt and 33,000 for 1500-watt lamps.

TABLE 1—AREA EFFECTIVELY LIGHTED

Mounting Height	"A"	"B"	"C"
20 Feet	40'	60'	50'
25 Feet	50'	75'	60'
30 Feet	60'	90'	75'
35 Feet	70'	105'	85'
40 Feet	80'	120'	100'
50 Feet	100'	150'	125'

NOTE—It will be seen, from the area of effective illumination shown in Diagram 1, that the spacing distance between units should never be more than twice the mounting height.

TABLE 2—FOOT CANDLES ON HORIZONTAL†

Mounting Height	Lamp Watts	"D"	"E"	"F"	"G"	"H"
*20 Feet	750	3.1	.36	.1	.03	
	1000	4.3	.5	.14	.04	
	1500	6.9	.8	.23	.06	
*25 Feet	750	2.8	.5	.22	.06	.02
	1000	3.9	.7	.3	.09	.03
	1500	6.2	1.1	.48	.15	.05
*30 Feet	750	2.3	.65	.28	.1	.04
	1000	3.1	.9	.38	.14	.05
	1500	5.0	1.5	.61	.23	.08
*35 Feet	750	1.8	.7	.33	.14	.06
	1000	2.5	1	.46	.2	.09
	1500	4.0	1.6	.74	.32	.15
40 Feet	750	1.4	.7	.36	.18	.07
	1000	2	1	.5	.25	.1
	1500	3.2	1.6	.8	.4	.16
*50 Feet	750	.94	.7	.41	.23	.09
	1000	1.3	.94	.57	.32	.12
	1500	2.1	1.5	.91	.51	.19

\*NOTE—Intensities for these mounting heights are for points on the line X-X only, as shown in Diagram 1. Foot candle values in the above table are for one unit only.

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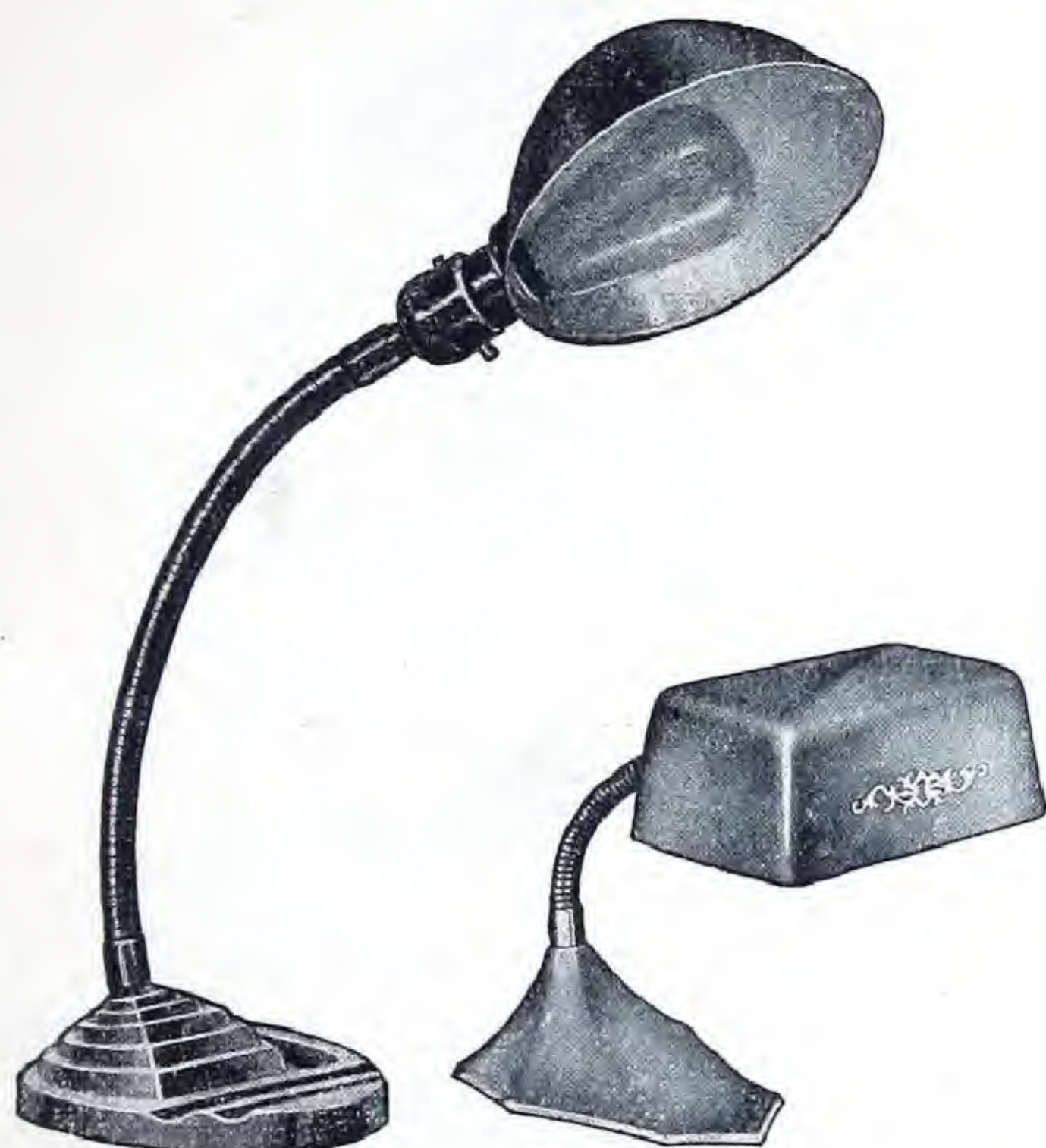
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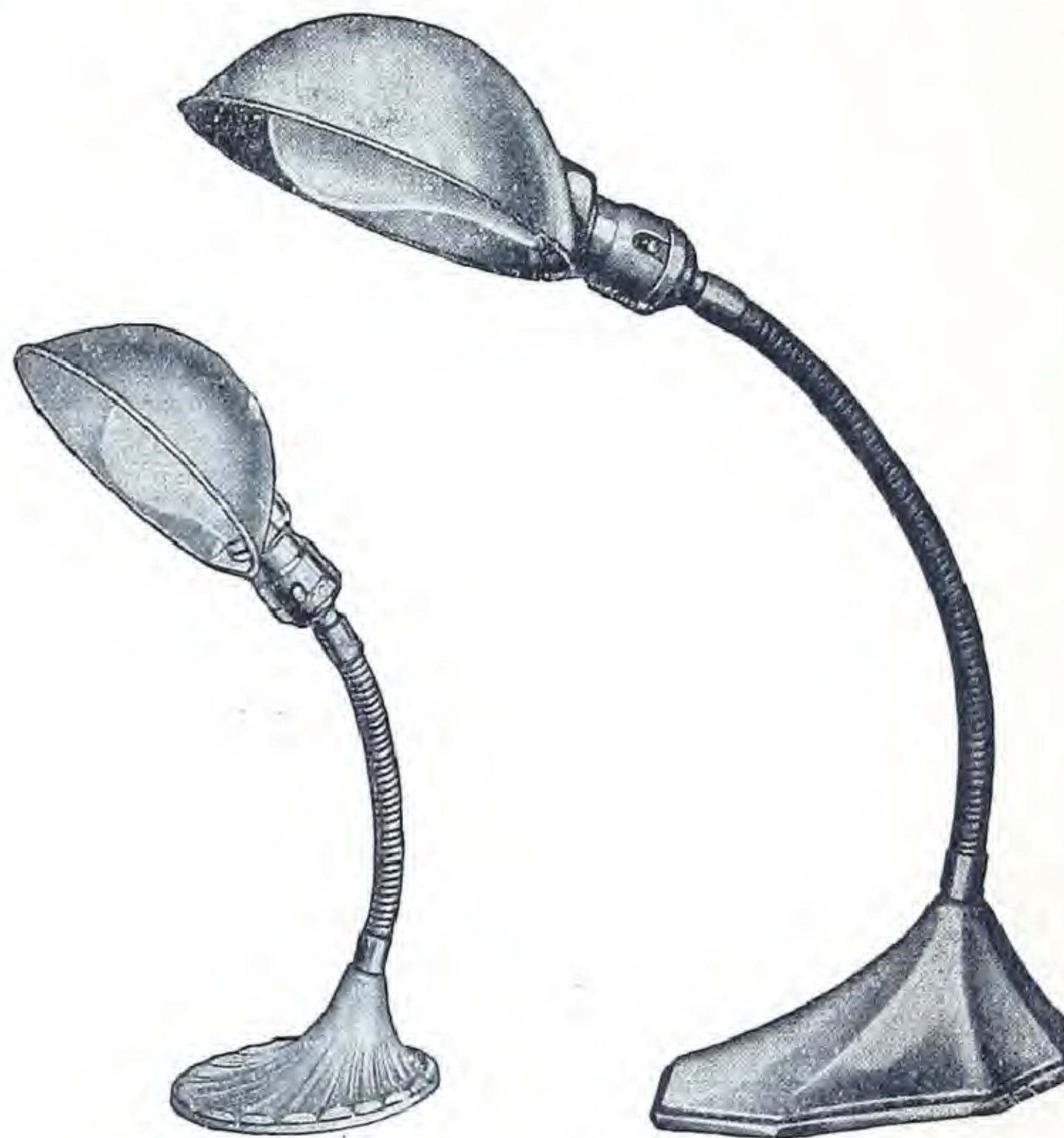


## Amalgamated Portable Lamps



No. 73

No. 8048



No. 74

No. 76

## Flexible Arm Desk Lamps

These lamps are equipped with six feet of cord and attachment cap. All items are packed individually.

CATALOGUE NUMBERS	FINISH	ARM	SOCKET	STD. PKG.	WT. LBS. STD. PKG.
73	Autumn Brown.....	10"	Push Thru	12	65
74	Spray Brown.....	8"	Push Thru	12	55
76	Statuary Bronze or Polished Copper.....	12"	Push Thru	6	36
8048	Statuary Bronze.....	8"	Push Thru	6	42

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## Utility Clamp Lights

Clamps - Stands - Hangs



No. 8001  
No. 8003

## Desk Lamp

With Metal Shade



No. 8075

CATALOGUE NUMBER	FINISH	ARM	SOCKET	STD. PKG.	WT. LBS. STD. PKG.
8001	Brushed Brass.....	3 1/2"	Push Thru	12	25
8003	Statuary Bronze.....	3 1/2"	Push Thru	12	25
8075	Sprayed Bronze Finish.....	14"	Push Thru	6	72

All items individually packed

## Bed Lamps

Positive Clamp to All Types of Beds



No. 8028  
No. 8029

## Piano Lamp

For use with Upright Pianos



No. 8018

CATALOGUE NUMBER	FINISH	SIZE	SHADE	STANDARD PACKAGE	WGT. LBS. STD. PKG.
8028	Two-tone Ivory.....	8 3/8" x 4 1/8"	Metal	12	40
8029	Statuary Bronze.....	8 3/8" x 4 1/8"	Metal	12	40
8018	Statuary Bronze.....	8 3/8" x 4 1/8"	Metal	6	21

All items individually cartoned for shipping

# Northern Electric

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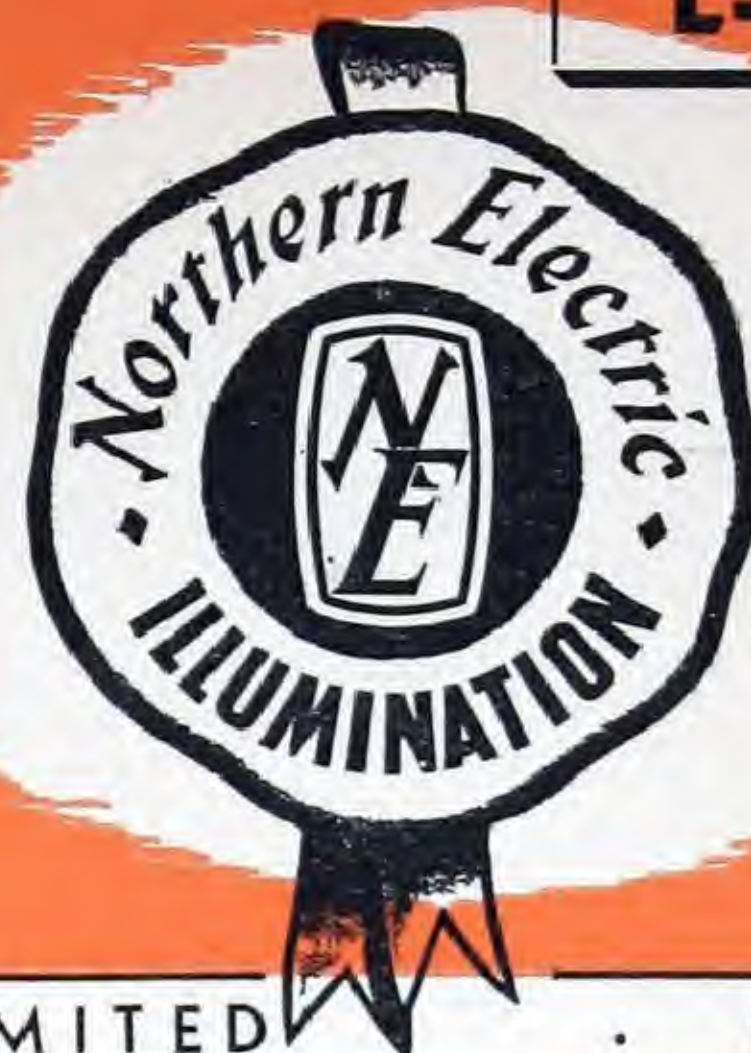
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# Nor-Lectric BULLETIN

July 1944

L-8-1



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1944

## Amalgamated Portable Lamps



No. 73



No. 8048



No. 74



No. 76

## Flexible Arm Desk Lamps

These lamps are equipped with six feet of cord and attachment cap.

All items are packed individually.

CATALOGUE NUMBERS	FINISH	ARM	SOCKET	STD. PKG.	WT. LBS. STD. PKG.
73	Autumn Brown	10"	Push Thru	12	65
74	Spray Brown	8"	Push Thru	12	55
76	Statuary Bronze or Polished Copper	12"	Push Thru	6	36
8048	Statuary Bronze	8"	Push Thru	6	42

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## Utility Clamp Lights

Clamps - Stands - Hangs



No. 8001  
No. 8003

## Desk Lamp

With Metal Shade



No. 8075

CATALOGUE NUMBER	FINISH	ARM	SOCKET	STD. PKG.	WT. LBS. STD. PKG.
8001	Brushed Brass.....	3 1/2"	Push Thru	12	25
8003	Statuary Bronze.....	3 1/2"	Push Thru	12	25
8075	Sprayed Bronze Finish.....	14"	Push Thru	6	72

All items individually packed

## Bed Lamps

Positive Clamp to All Types of Beds



No. 8028  
No. 8029

## Piano Lamp

For use with Upright Pianos



No. 8018

CATALOGUE NUMBER	FINISH	SIZE	SHADE	STANDARD PACKAGE	WGT. LBS. STD. PKG.
8028	Two-tone Ivory.....	8 3/8" x 4 1/8"	Metal	12	40
8029	Statuary Bronze.....	8 3/8" x 4 1/8"	Metal	12	40
8018	Statuary Bronze.....	8 3/8" x 4 1/8"	Metal	6	21

All items individually cartoned for shipping

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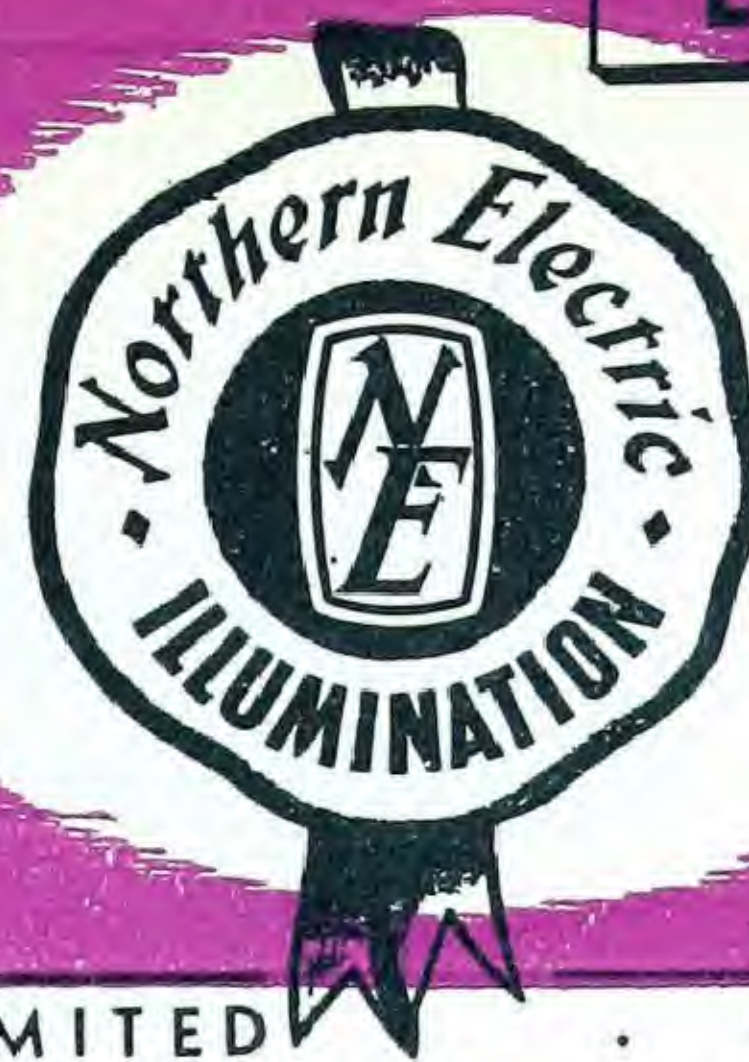
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# Nor-Lectric BULLETIN

November 1944

L-10-2

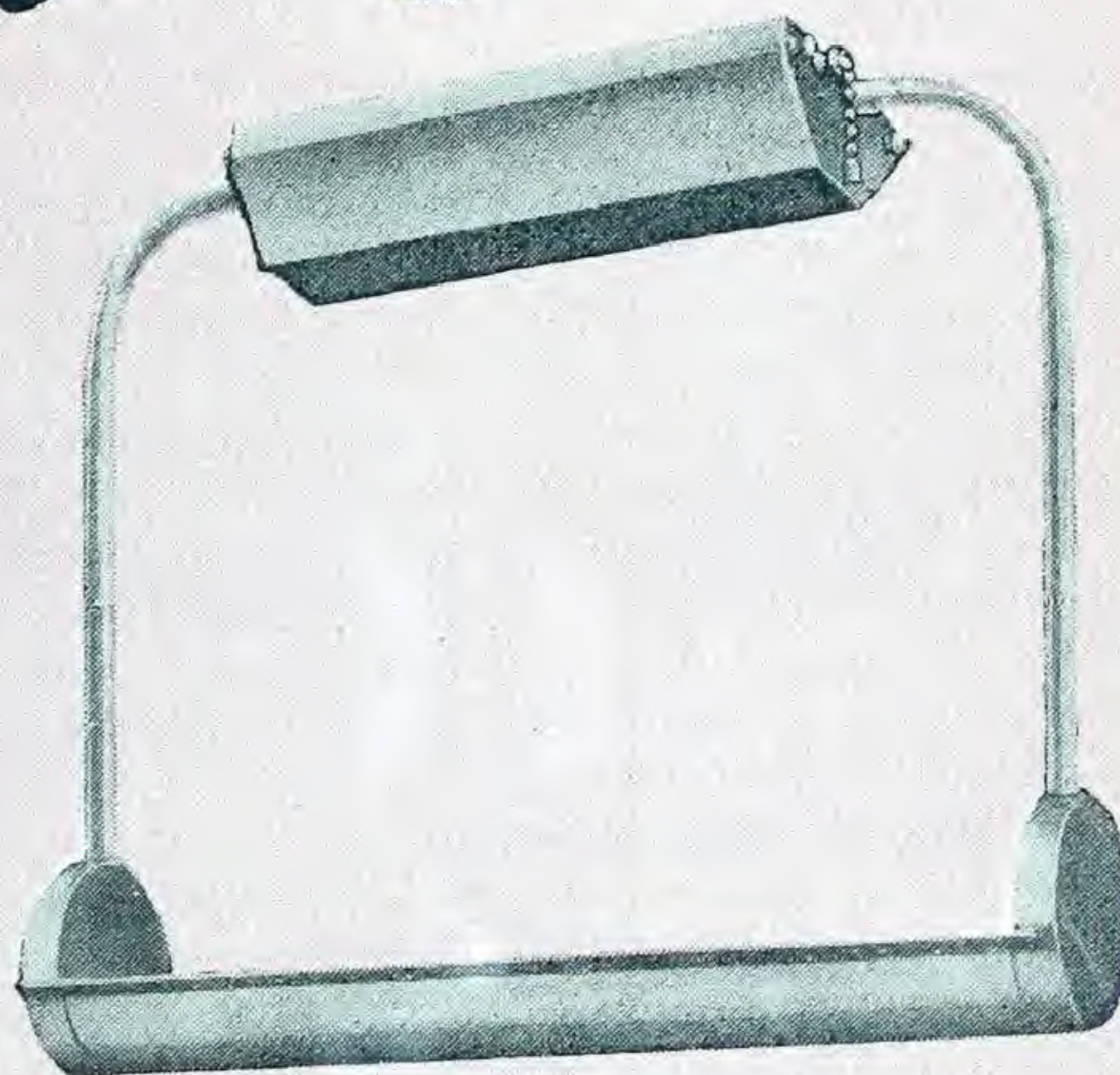


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## Germicidal UNITS FOR DESTROYING Airborne Germs

PENDANT TYPE CLEANAIREs are the most efficient type of radiators and, being placed in the area of greatest air circulation, their germ-killing rays have the greatest opportunity to be effective.

Standard suspension is 4' overall from the ceiling, which can easily be shortened, if necessary. The lower part of the unit should be 8' from the floor. Overall length of reflector for 15 watt lamp is 19 $\frac{1}{4}$  inches; for 30 watt lamp is 37 $\frac{1}{4}$  inches. Pull chain switch is provided.



Lamp Size in Watts	Catalogue Numbers		
	60C-HPF	60C-LPF	25C-LPF
15	6230-C	6230-A	6230-F
30	6231-C	6231-A	6231-F

For use wherever the growth of bacteria must be controlled or prevented.

OFFICES — SCHOOLS — HOSPITALS — FIRST AID ROOMS — NURSERIES — RESTAURANTS  
MEAT STORAGE REFRIGERATORS — FACTORIES — PUBLIC BUILDINGS — PRIVATE HOMES  
DORMITORIES — FOOD PROCESSING PLANTS — THEATRES

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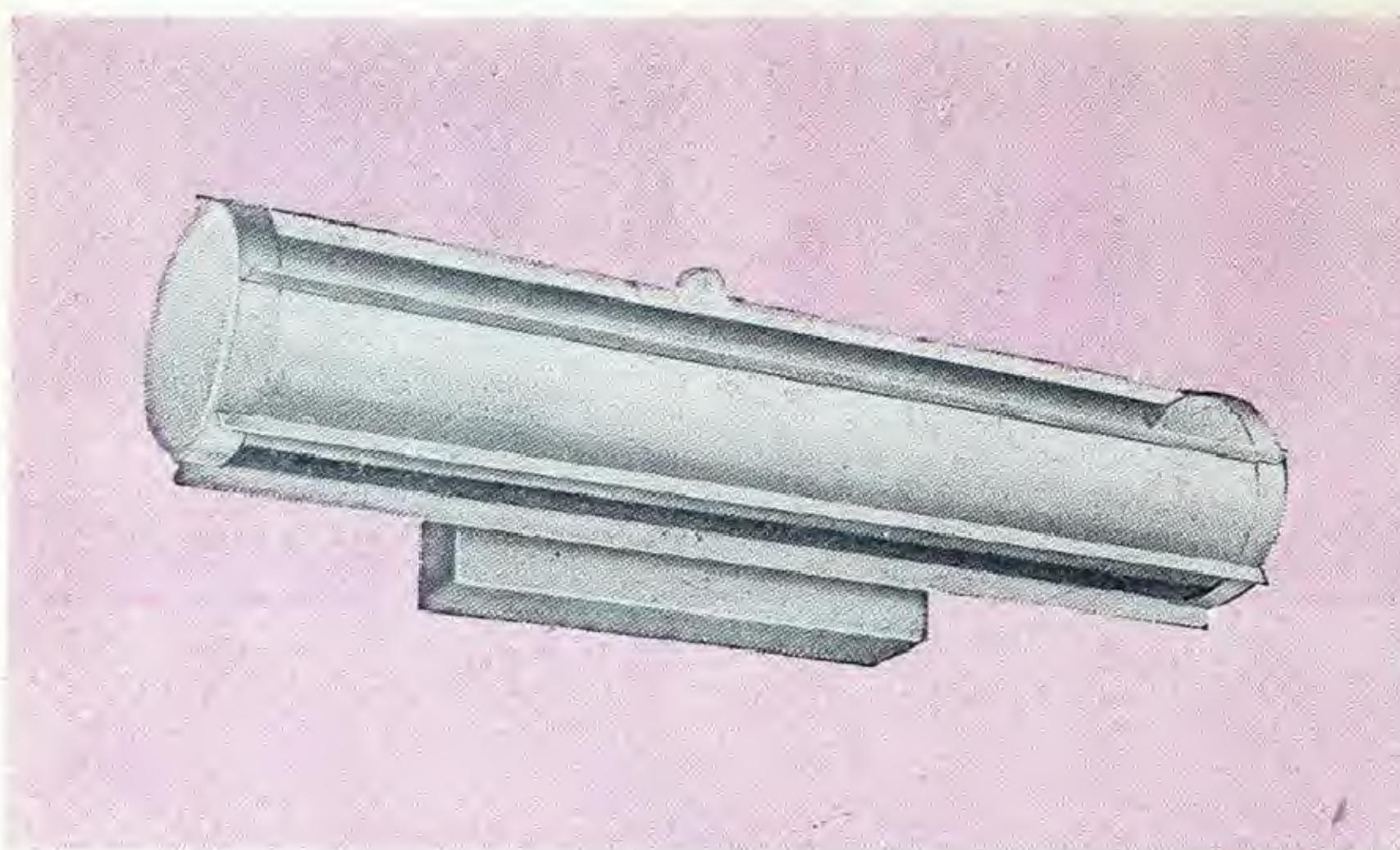
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## Bracket Type Cleanaires

May be mounted on a wall or over a doorway. An adjustable shutter directs the radiation upward or downward or both. Over the door the downward radiation forms a screen of ultra-violet radiation across the path of air-borne bacteria. Bracket type Cleanaires may be mounted on side-wall electrical outlets or hung from the wall by the tabs at the top of the backplate and fed by a cord and plug from a convenient outlet. Install 5' 6" above the floor or higher. Overall length of reflector for 15 watt lamp is 19 $\frac{1}{4}$ ". For 30 watt lamp is 37 $\frac{1}{4}$ ". Overall extension from wall is 5 $\frac{3}{4}$ ". Pull chain switch is provided in the backplate. Cord and plug supplied only when specified.

Lamp Size in Watts	Catalogue Numbers		
	60C-HPF	60C-HPF	25C-LPF
15	6232-C	6232-A	6232-F
30	6233-C	6233-A	6233-F



PRIVATE OFFICE



SCHOOLROOM

Wherever people are, there you will find air-borne germs which cause the spread of respiratory diseases. Air-borne germs and bacteria have the physical characteristics of extremely fine dry dust particles and are ordinarily invisible to the naked eye.

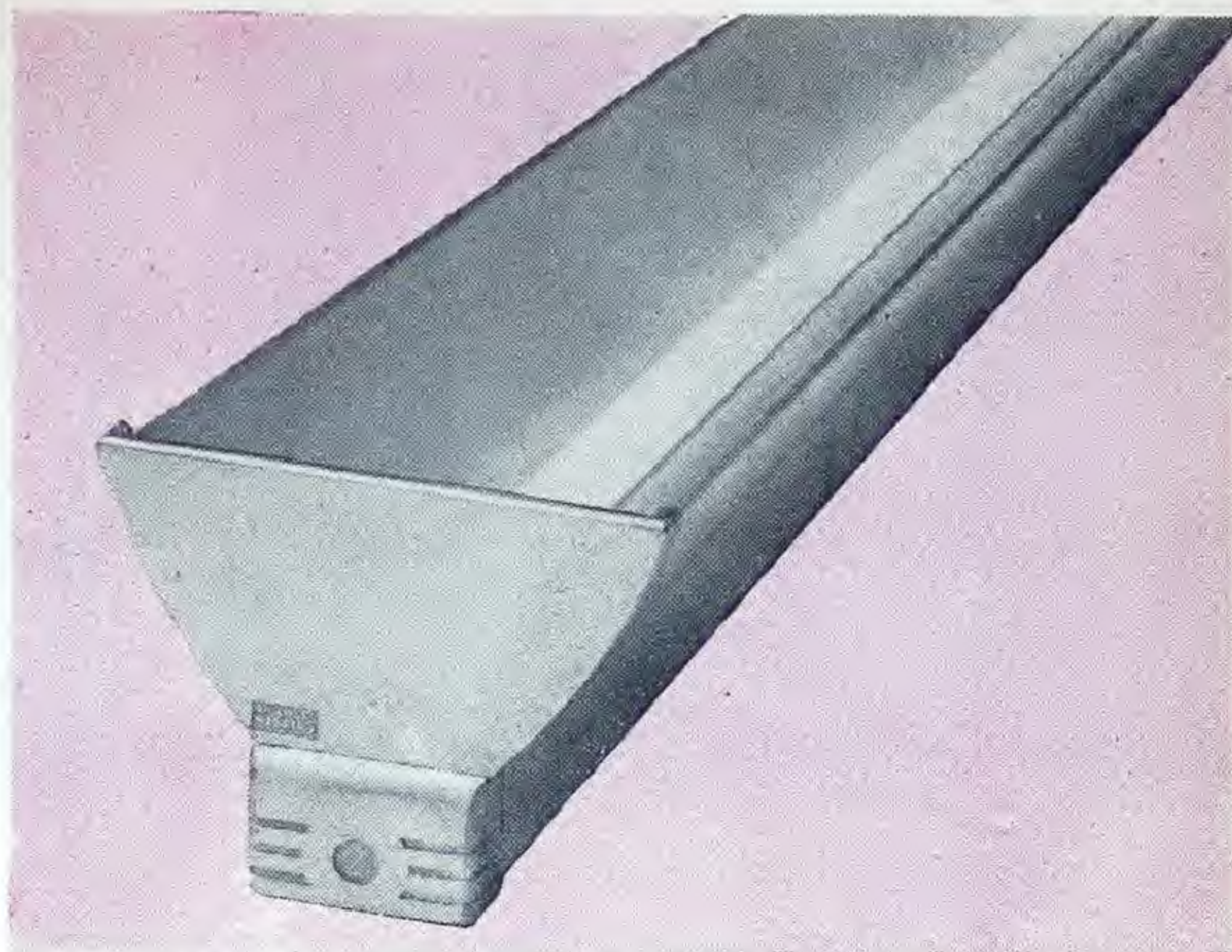
Bacteria are expelled from the nose and throat by coughing and sneezing in droplets of moisture. These droplets dry out but the bacteria remain suspended and drift long distances, borne on every current of air. Many of these germs are of the streptococci type, responsible for serious throat infections, erysipelas, scarlet fever, etc., and are commonly present in human noses and throats, even in the absence of infected tissue. For this reason, they are present in occupied rooms directly proportional to the number of persons present.

The destruction of these air-borne bacteria by ordinary germicidal agents has long been extremely difficult without objectionable effects on the air itself. Now we have ultra-violet radiation of germicidal wavelength (2537-A) which is an inherently powerful agent for the efficient destruction of air-borne bacteria. It can be introduced into any room without any change in comfort conditions of that room; the rays are practically unabsorbed by air and have **no** effect on it. They travel until intercepted by a wall or other absorbing medium, their effectiveness limited solely by the density of the bacteria.



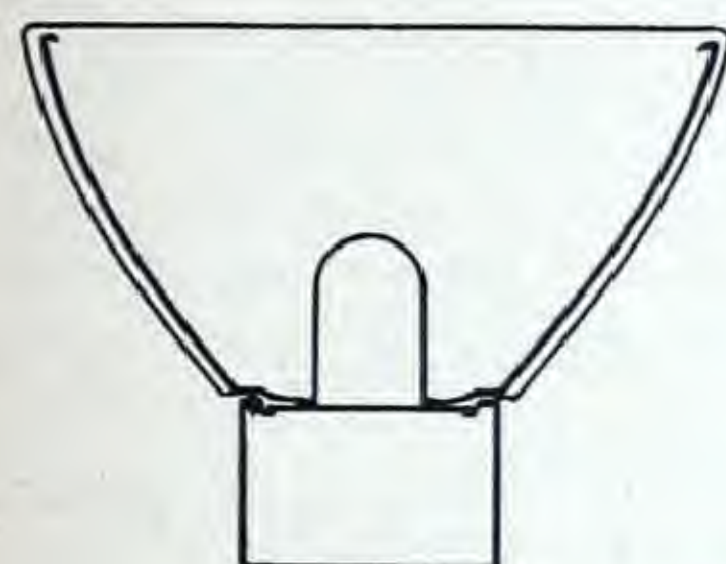
## GERMICIDAL CURTISTRIP

can be used for upward or downward radiation. They can be placed on top of bookcases or filing cabinets or can be suspended from the ceiling.



### DEEP REFLECTOR TYPE

For upward radiation, mount at least 4' above floor.  
For downward radiation, mount no higher than 6' above floor.

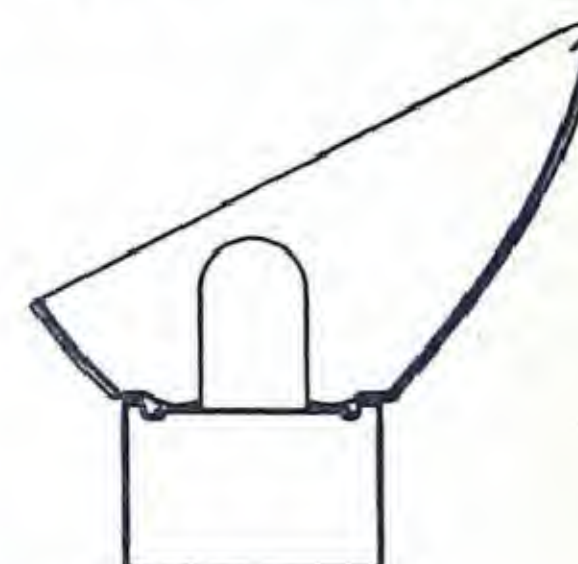


Lamp Size in Watts	Dimensions			Catalogue Numbers		
	Width	Length	Height	60C-HPF	60C-LPF	25C-LPF
15	6 $\frac{3}{8}$ "	18 $\frac{1}{4}$ "	4 $\frac{7}{8}$ "	201-GC	201-GA	201-GF
30	6 $\frac{3}{8}$ "	36 $\frac{1}{4}$ "	4 $\frac{7}{8}$ "	212-GC	212-GA	212-GF

### DIRECTIONAL REFLECTOR TYPE

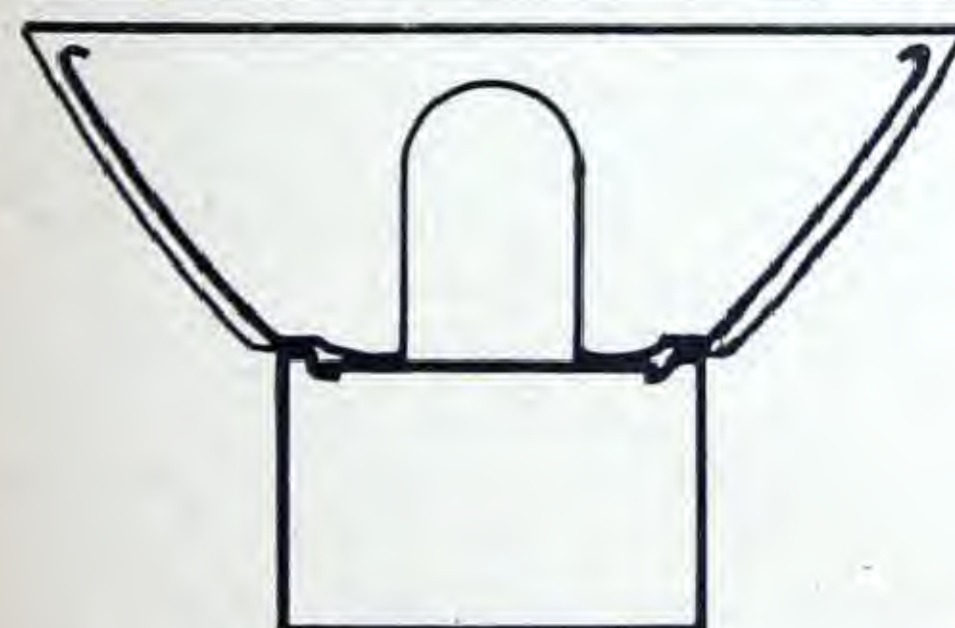
For upward radiation, mount at least 6' above floor.  
For downward radiation, mount no higher than 4' above floor.

Lamp Size in Watts	Dimensions			Catalogue Numbers		
	Width	Length	Height	60C-HPF	60C-LPF	25C-LPF
15	5 $\frac{1}{8}$ "	18 $\frac{1}{4}$ "	4 $\frac{7}{8}$ "	292-GC	292-GA	292-GF
30	5 $\frac{1}{8}$ "	36 $\frac{1}{4}$ "	4 $\frac{7}{8}$ "	302-GC	302-GA	302-GF



### SHALLOW REFLECTOR TYPE

For upward radiation, mount at least 5' above floor.  
For downward radiation, mount no higher than 5' above floor.



Lamp Size in Watts	Dimensions			Catalogue Numbers		
	Width	Length	Height	60C-HPF	60C-LPF	25C-LPF
15	5"	18 $\frac{1}{4}$ "	3 $\frac{3}{8}$ "	327-GC	327-GA	327-GF
30	5"	36 $\frac{1}{4}$ "	3 $\frac{3}{8}$ "	337-GC	337-GA	337-GF

### REFLECTORLESS TYPE

For use only in air ducts or under hoods where the lamp is entirely concealed from the eyes.

Lamp Size in Watts	Dimensions			Catalogue Numbers		
	Width	Length	Height	60C-HPF	60C-LPF	25C-LPF
15	2 $\frac{1}{2}$ "	18 $\frac{1}{4}$ "	3 $\frac{3}{8}$ "	444-GC	444-GA	444-GF
30	2 $\frac{1}{2}$ "	36 $\frac{1}{4}$ "	3 $\frac{3}{8}$ "	446-GC	446-GA	446-GF

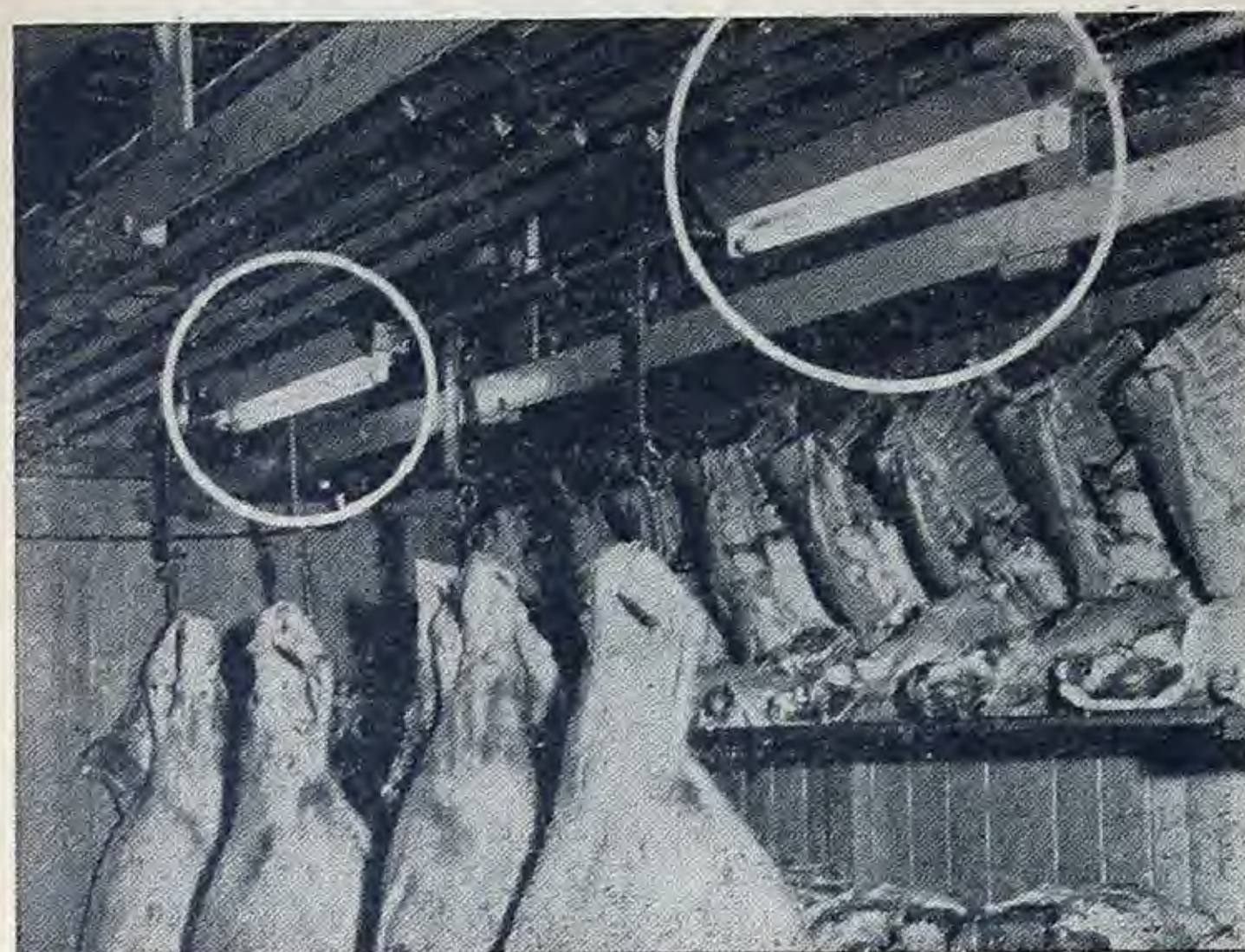


**SUSPENSION**—These units may be suspended from the ceiling by using two No. 614-G hangers, one at each end. Standard length 3' 0"—longer lengths can be supplied.

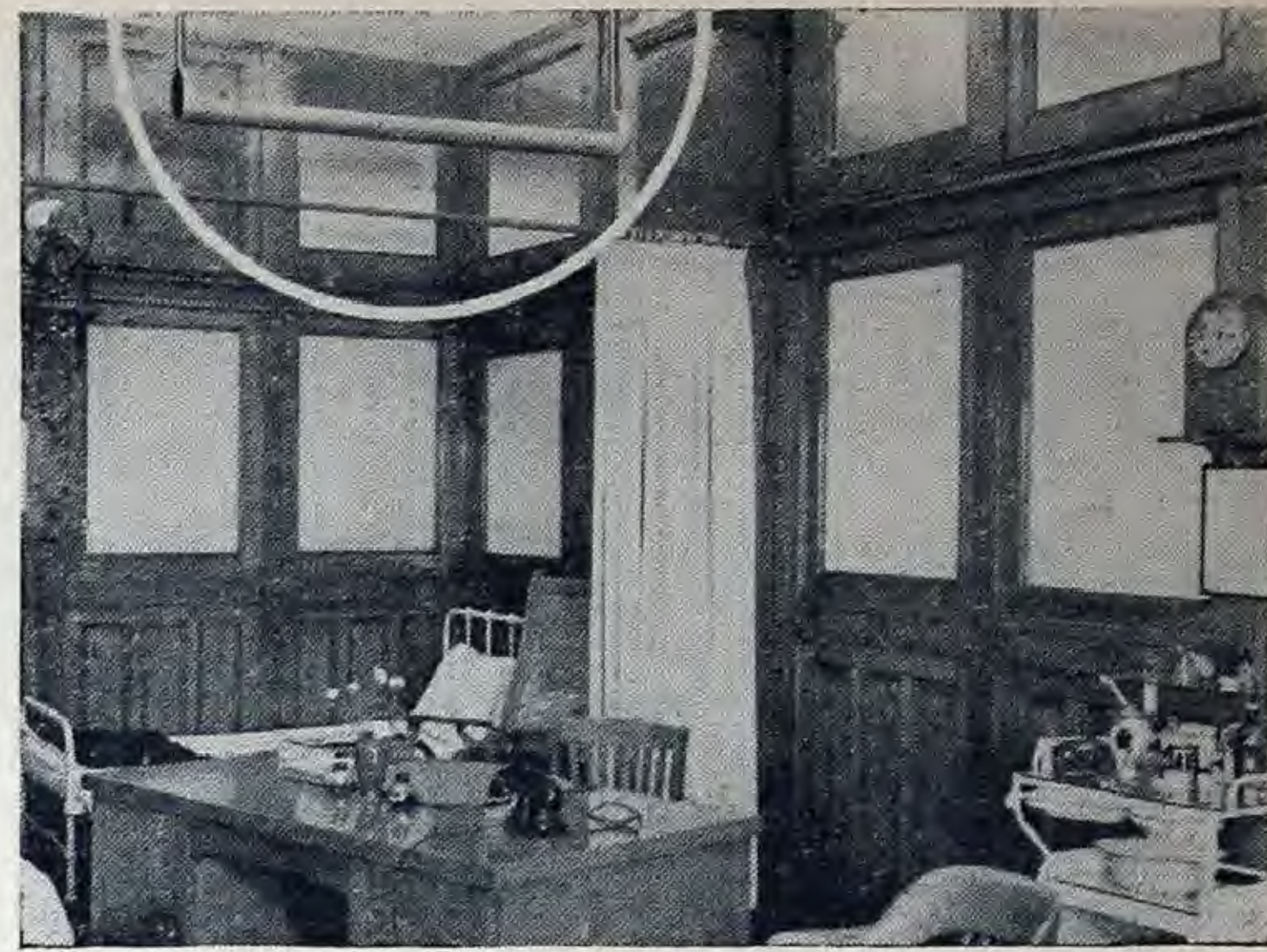
**SWITCH**—Catalogue numbers shown do not include switch. Toggle switch can be included if specified on the order.

**CORD AND PLUG**—Catalogue numbers shown include the units wired and assembled complete with ballast but do not include cord or plug. If required, they can be furnished when specified on the order.





MEAT STORAGE REFRIGERATOR



FIRST AID ROOM

### LAMPS

The electrical characteristics and physical dimensions of germicidal lamps are identical to those of fluorescent lamps of the same wattage. There is no fluorescent powder on the tube, which is made of glass having a high transmission factor for the 2537A radiation, the particular wavelength most deadly to air-borne bacteria. The illumination from germicidal lamps is about the same in colour and brightness range as moonlight. The blue light emitted from germicidal units, the maximum always being less than bright moonlight, is excellent for replacing night lights in hospital rooms, wards and corridors.

### APPLICATION

Average winter ventilation due to door and window leakage gives less than five air changes per hour. Mechanical ventilation gives approximately fifteen to twenty. Actual tests show that by direct radiation of a room with 2537A ultra-violet, it is possible to secure a sanitary ventilation equivalent to 100 CHANGES PER HOUR, with a total input to germicidal lamps of  $\frac{1}{4}$  to  $\frac{1}{2}$  watt per 100 cubic feet of room volume.

For an effect equivalent to 100 air changes per hour, the floor area per lamp is as follows:

Room Ceiling Height	8	10	12	14	16 feet
Area per 4 watt lamp	28	35	42	48	54 sq. feet
Area per 8 watt lamp	70	85	105	120	140 sq. feet
Area per 15 watt lamp	145	180	215	250	290 sq. feet
Area per 30 watt lamp	360	450	540	630	720 sq. feet

The above table of ultra-violet radiation is suitable for average conditions. The amount of ultra-violet radiation needed depends upon the rate of contamination, and the probability of epidemic spread; for example, hospital wards would need three or four times more than average requirements.

### GERMICIDAL BARRIERS

A germicidal ultra-violet barrier is used to provide a well-defined vertical barrier of such high lethal energy content as to kill practically all bacteria borne through it on ordinary air currents. These barriers may be used to isolate sections of a hospital ward or to frame an entrance.

### AIR DUCT IRRADIATION

Ultra-violet radiation can be combined with an air conditioning system by installing the lamps in the ventilating ducts. For best efficiency and reduction of lamp cleaning, the lamp should irradiate the air after it has been heated and filtered. One 15 watt germicidal lamp will give 90% killing of bacteria for 500 to 600 cubic feet of air per minute. If the ducts are lined with aluminum in the area where the lamps are installed and beyond it in each direction a distance approximately twice the diameter of the duct, this rating can be greatly increased.

As forced ventilation is usually limited to about twenty air changes per hour, it cannot keep a room as sterile as would units installed in the room itself. It does provide an economical method of cleaning re-circulated air, minimizing the amount of outside air necessary and can prevent cross contamination between different parts of a building, as in hospitals and penal institutions.

### PRECAUTIONS

Care must be taken when installing germicidal lamps to prevent direct rays from the lamps being either in the direct line of vision or where exposed skin would be irradiated. As certain precautions and limitations must be observed, every installation should be planned by engineers familiar with the use of this equipment.

### MAINTENANCE

Lamps and reflectors must be kept clean. Very slight films of dust, dirt or grease can very materially reduce the germicidal effect.

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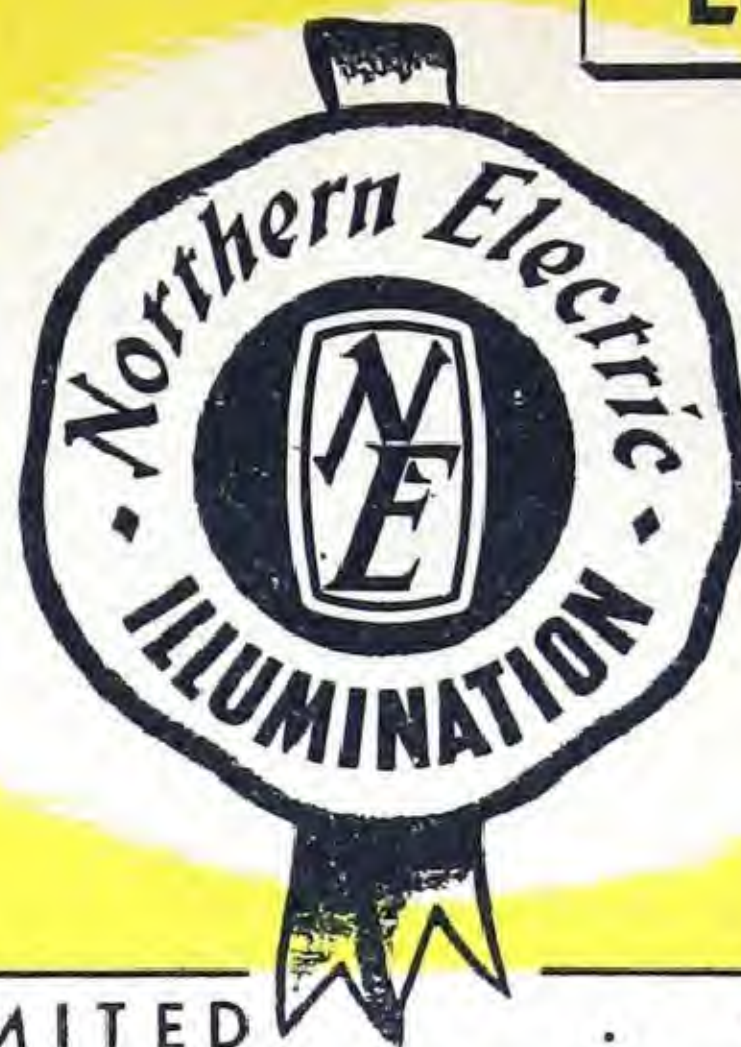
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# *Nor-Lectric* BULLETIN

April 1944

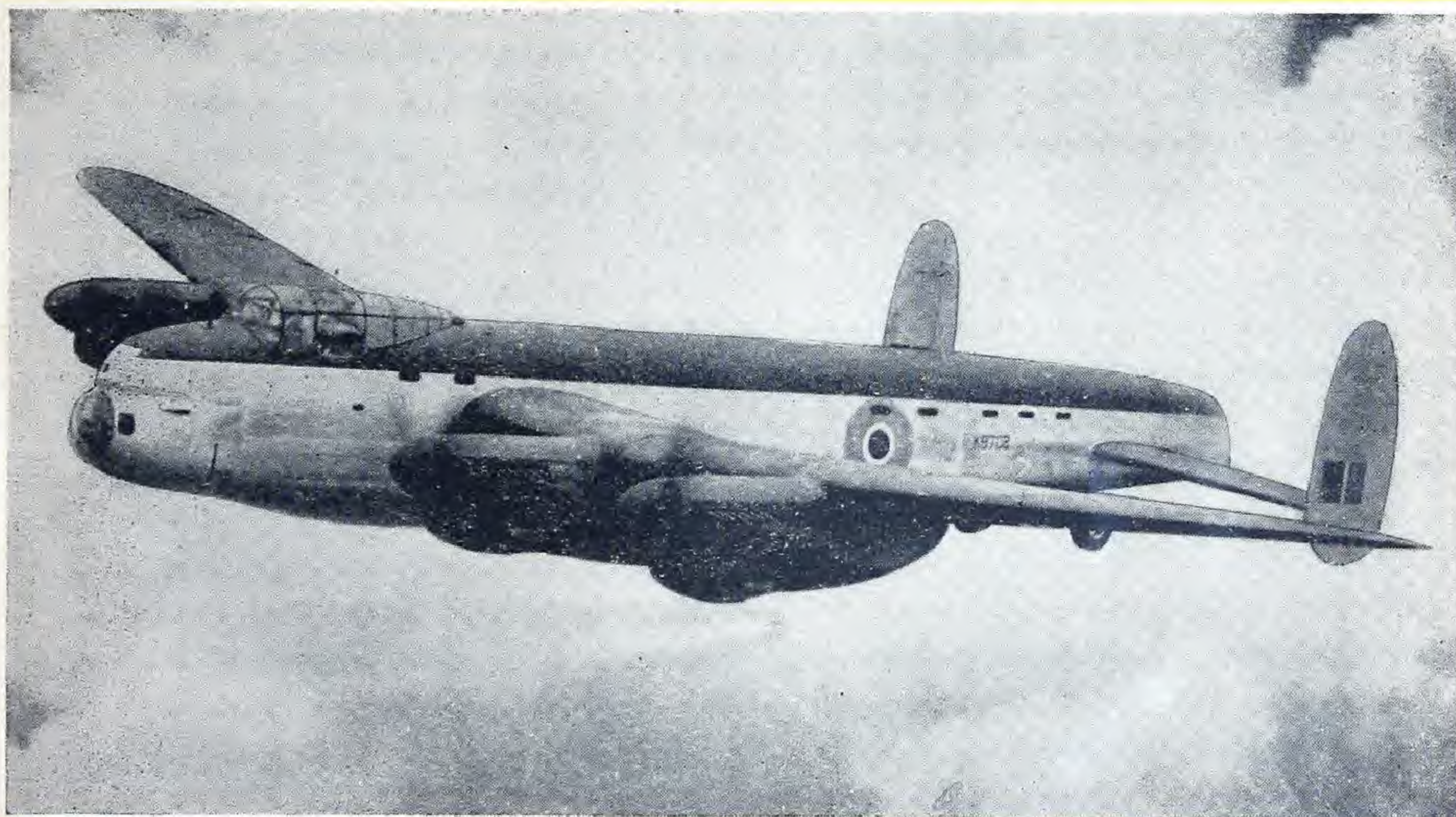
L-12-1



ISHED BY NORTHERN ELECTRIC COMPANY LIMITED

1944

## LOCALITES FOR AIRCRAFT



Flight operating personnel on bombing missions have critical seeing tasks, too. The navigator constantly plots a course—and the pilot always knows his position. This continuous task requires the navigator to work with charts, protractor, slide rule and compass. Each chart table is lighted with a Fostoria Localite so the navigation officer may control the light direction and intensity to fit his specific requirements.

Aviation applications dictate a rugged, yet flexible, assembly. Reflectors meet rigid illumination standards—yet the exterior surfaces cannot cause specular reflection.

### NORTHERN ELECTRIC LIGHTING SERVICE

All across Canada the Northern Electric has a highly trained staff of Lighting Engineers. Trained in peacetime, these men are ready to assist you in selecting and applying Lighting Equipment in your war activities.

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## LOCALITES FOR AIRCRAFT



### MODEL No. M-1295-1

**Specifications:** Equipped with a  $2\frac{3}{4}$ " Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.



### MODEL No. M-12424-1

**Specifications:** Equipped with a  $2\frac{3}{4}$ " Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.



### MODEL No. A-11-1

**Specifications:** Equipped with 3" diameter molded plastic reflector fitted with a keyless socket and wiring and three fibre tube intermediate arms having stainless steel ball clamps and rag-content phenolic balls and high-impact phenolic plastic base.



### MODEL No. M-1331-1

**Specifications:** Equipped with a  $2\frac{3}{4}$ " Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.



### MODEL No. M-112-1

**Specifications:** Equipped with a  $2\frac{3}{4}$ " Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.



### MODEL No. M-1-1

**Specifications:** Equipped with a  $2\frac{3}{4}$ " Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.

### APPLIES TO ALL MODELS

All wiring will consist of No. AN-20 Flamenol Insulated Aircraft Cable, two single conductors enclosed in extruded transflex vinylite tubing; wire to extend a distance of 12", and vinylite tubing to extend a distance of 10" from the base. Free ends of wire to be stripped approximately  $\frac{1}{2}$ ". Longer than standard cord extension can be supplied when required.

All Localites equipped with D.C. bayonet base sockets.

Reflector on Model A-11-1 is 3" diameter, all others are  $2\frac{3}{4}$ " diameter.

Final selection of bulb must be based on operating voltage of aircraft. Diameter of bulb should not exceed approximately  $1\frac{3}{8}$ ".

All vinylite transflex tubing is No. 4 (.208" I.D.—.020" Wall).

**FINISH ON ALL MODELS:** Interior is synthetic gloss white, washable, non-yellowing, heat resistant; exterior is matte black. Both finishes baked by the near infrared process.

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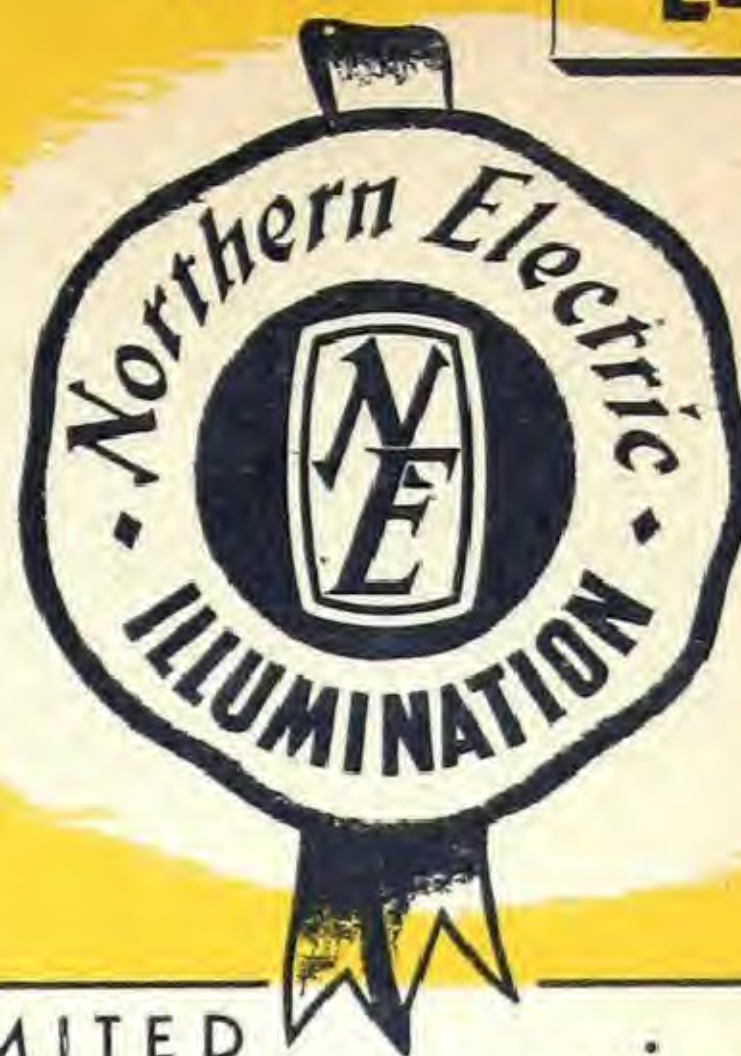
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# *Nor-Lectric* BULLETIN

APRIL 1944

L-12-1



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# LOCALITES FOR AIRCRAFT

1 1/2" 8" 5 5/8" 6 1/8"



## MODEL No. M-1295-1

**Specifications:** Equipped with a 2 3/4" Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.

1 1/2" 11 3/4" 5 5/8" 6 1/8"



## MODEL No. M-12424-1

**Specifications:** Equipped with a 2 3/4" Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.

1 1/2" 12" 12" 5 5/8" 5 1/8"



## MODEL No. A-11-1

**Specifications:** Equipped with 3" diameter molded plastic reflector fitted with a keyless socket and wiring and three fibre tube intermediate arms having stainless steel ball clamps and rag-content phenolic balls and high-impact phenolic plastic base.

1 1/2" 5 5/8" 6 1/8"



## MODEL No. M-1331-1

**Specifications:** Equipped with a 2 3/4" Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.

3 1/8" 6 1/8"



## MODEL No. M-112-1

**Specifications:** Equipped with a 2 3/4" Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.

6 1/8"



## MODEL No. M-1-1

**Specifications:** Equipped with a 2 3/4" Parabolic reflector with a double contact bayonet key socket and wiring. All metal parts are of non-magnetic brass.

## APPLIES TO ALL MODELS

All wiring will consist of No. AN-20 Flamenol Insulated Aircraft Cable, two single conductors enclosed in extruded transflex vinylite tubing; wire to extend a distance of 12", and vinylite tubing to extend a distance of 10" from the base. Free ends of wire to be stripped approximately 1/2". Longer than standard cord extension can be supplied when required.

All Localites equipped with D.C. bayonet base sockets.

Reflector on Model A-11-1 is 3" diameter, all others are 2 3/4" diameter.

Final selection of bulb must be based on operating voltage of aircraft. Diameter of bulb should not exceed approximately 1 3/8".

All vinylite transflex tubing is No. 4 (.208" I.D.—.020" Wall).

**FINISH ON ALL MODELS:** Interior is synthetic gloss white, washable, non-yellowing, heat resistant; exterior is matte black. Both finishes baked by the near infrared process.

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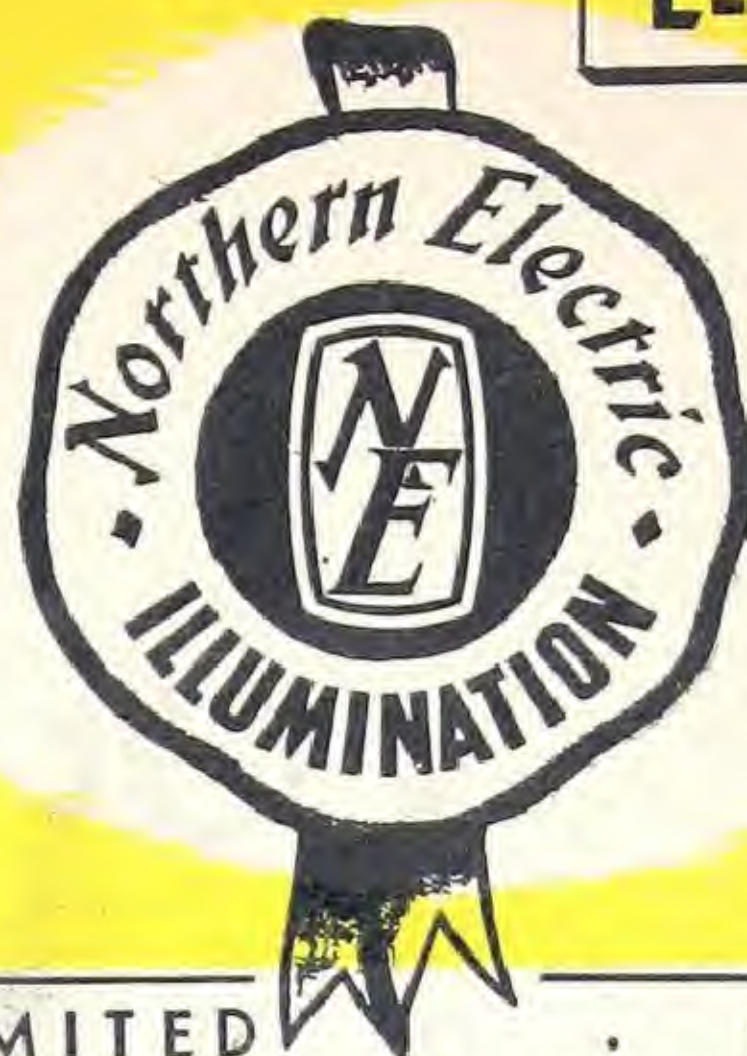


**Nor-Lectric**

October 1944

L-12-15

# BULLETIN



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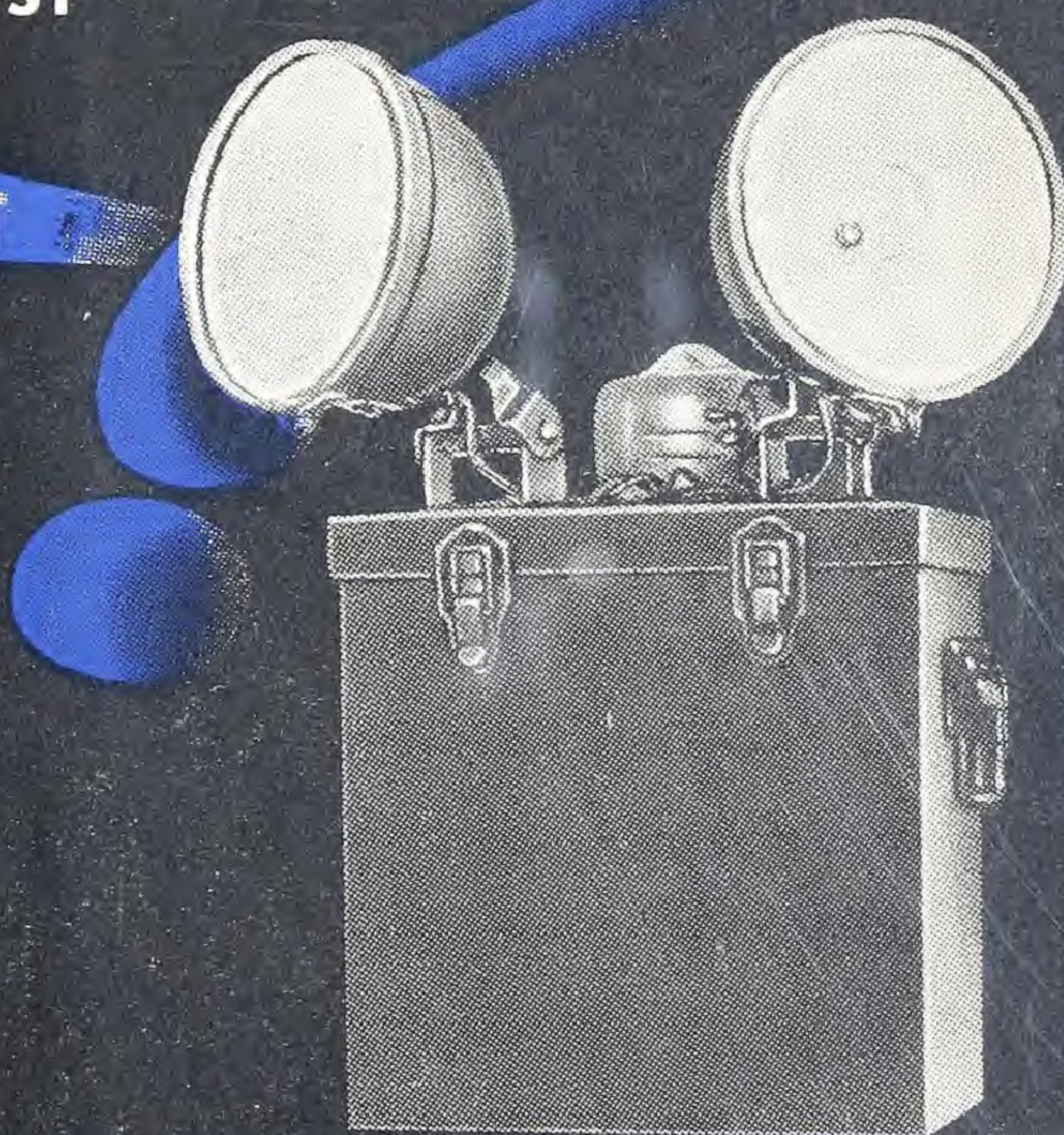
## IF THE LIGHTS GO OUT

ARE YOU PROTECTED AGAINST

**Electric Loss ACCIDENT**

BATTERY OPERATED  
EMERGENCY LIGHTS  
LIGHT AUTOMATICALLY  
ON REGULAR CURRENT FAILS

RES, THEATRES, SCHOOLS, HOTELS,  
CLUBS, HOSPITALS, FACTORIES,  
EMERGENCY STAIRWAYS, AUDITORIUMS  
ALL PLACES OF PUBLIC ASSEMBLY



TYPE DUL

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# MASTER-LIGHTS

## STORAGE BATTERY MODELS

The DUL Emergency Units are the most powerful Standard Automatic lighting units made; they illuminate an area of 60 ft. sq. (3600 sq. ft.) or larger.

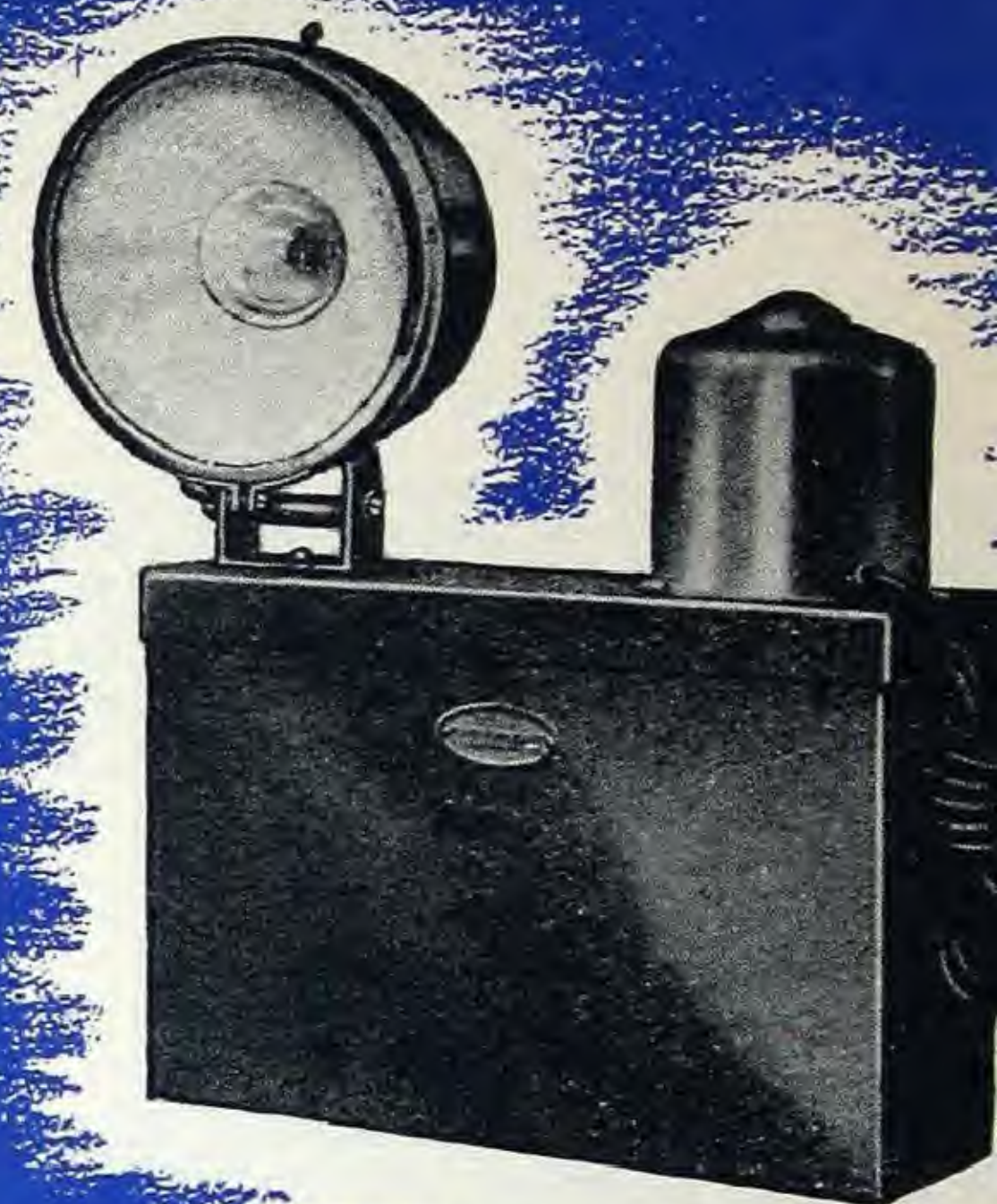
In all but the largest theaters, two DULS will adequately illuminate the first floor and two balconies.

No trickle charger is needed; these units are fully equipped with a special rechargeable long life battery. If no light is used the battery will retain approximately 85% of its charge for a full year.

The type SUL Automatic Emergency light is the same as the DUL with smaller battery and one floodlight for use in smaller areas.

Type	Overall Height	Battery Box	Diameter of Reflector
DUL	17"	8 $\frac{1}{4}$ " x 10" x 10" high	5 $\frac{1}{4}$ "
SUL	16"	4" x 11" x 8" high	5 $\frac{1}{4}$ "

TYPE S



All models can be supplied for use on 115 or 220 volt, 60 or 25 cycle or direct current circuits. Current characteristics should be stated when ordering

## TYPE AJ2



## DRY BATTERY MODEL

Type AJ-2 lantern is a trusty automatic dry battery lantern. Unusually strong, yet light in weight. Gives a powerful beam of light with a wide spot. Uses 2 No. 6 dry cell batteries. Equipped with a special hanging bracket, the AJ-2 emergency light may be used as a wall bracket or a hand lantern.

Finish—grey enamel.

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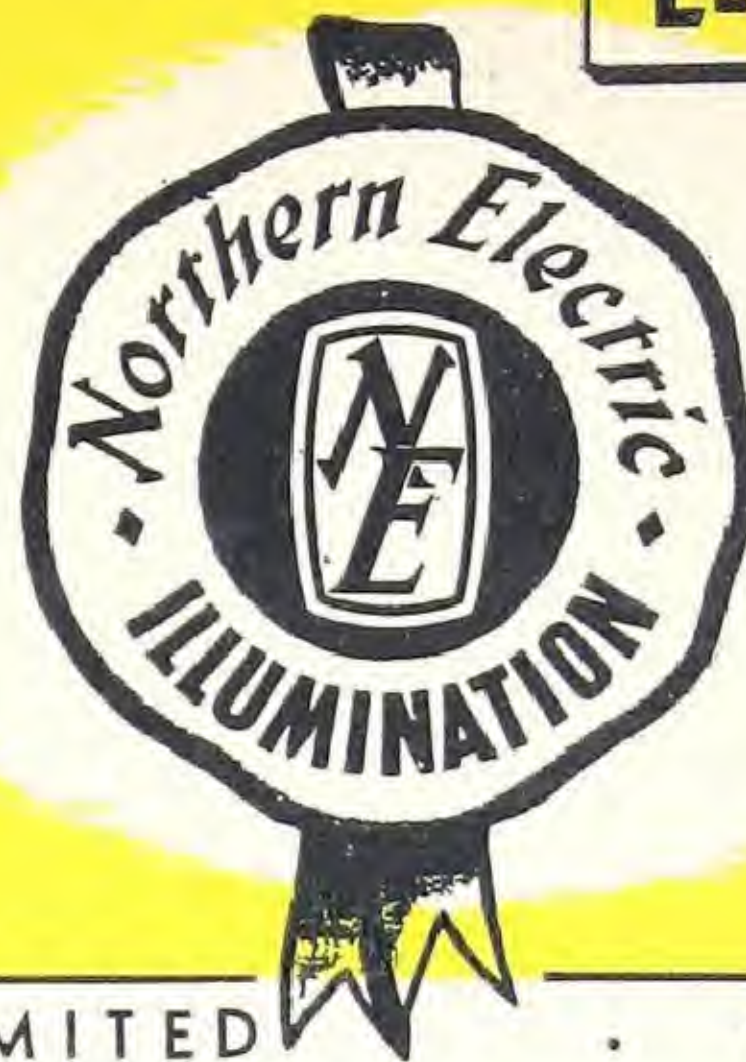


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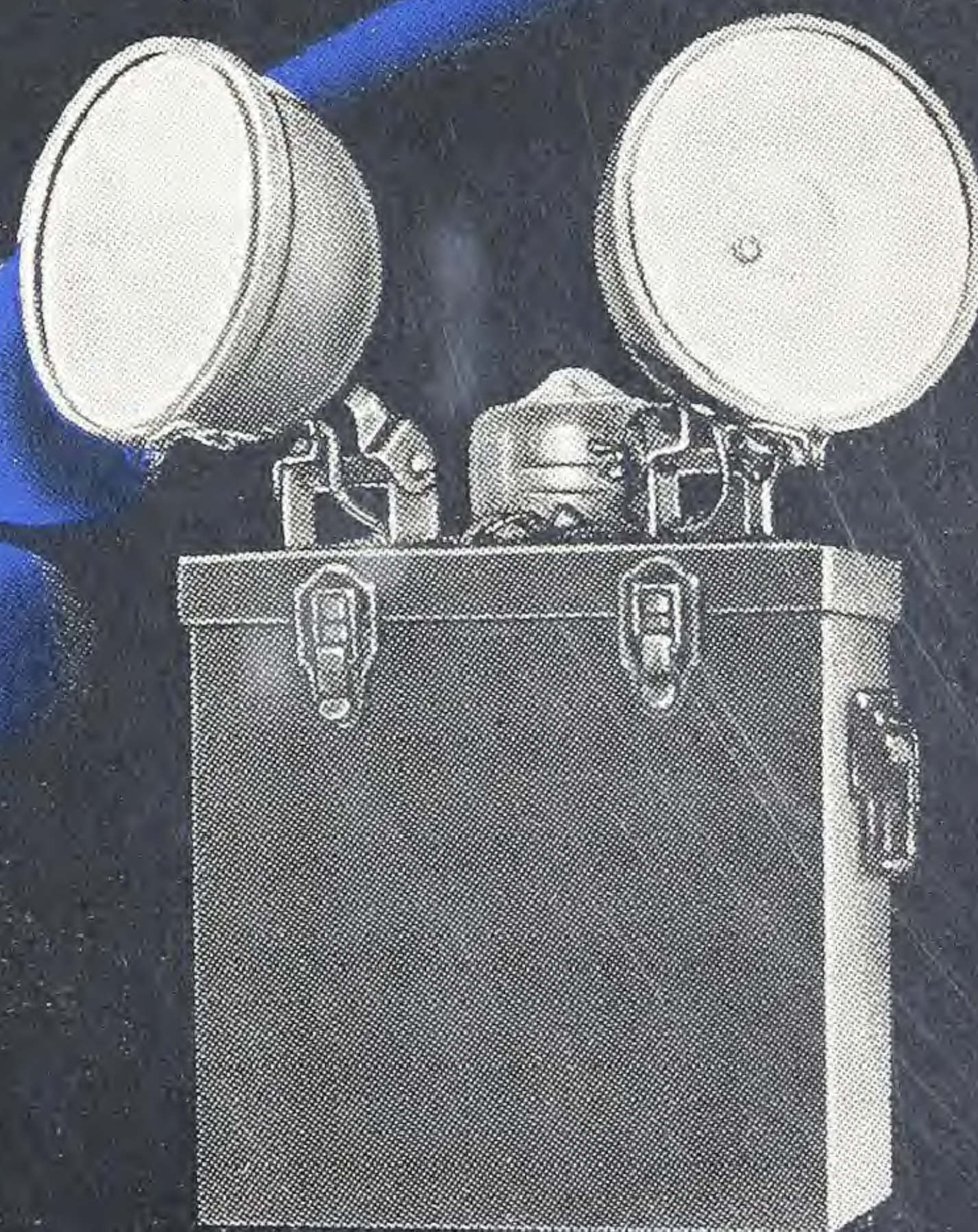
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## IF THE LIGHTS GO OUT ARE YOU PROTECTED AGAINST

**ANIC LOSS ACCIDENT**

**BATTERY OPERATED  
MASTER LIGHT EMERGENCY UNITS  
LIGHT AUTOMATICALLY  
WHEN REGULAR CURRENT FAILS**

**DRES, THEATRES, SCHOOLS, HOTELS,  
IGHT CLUBS, HOSPITALS, FACTORIES,  
MERGENCY STAIRWAYS, AUDITORIUMS  
ID ALL PLACES OF PUBLIC ASSEMBLY**



**TYPE DUL**

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# MASTER - LIGHTS

## STORAGE BATTERY MODELS

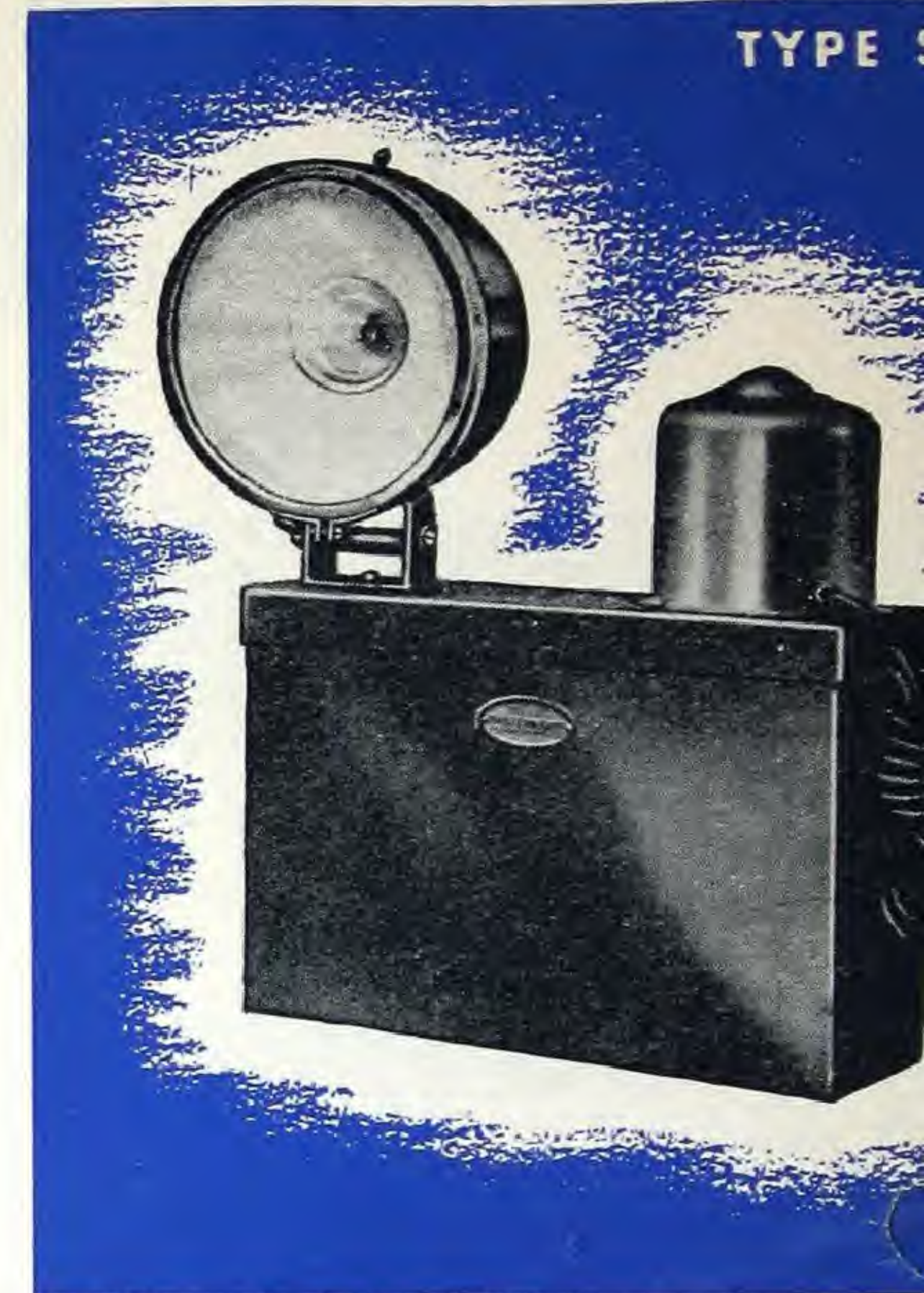
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Finish—grey enamel.

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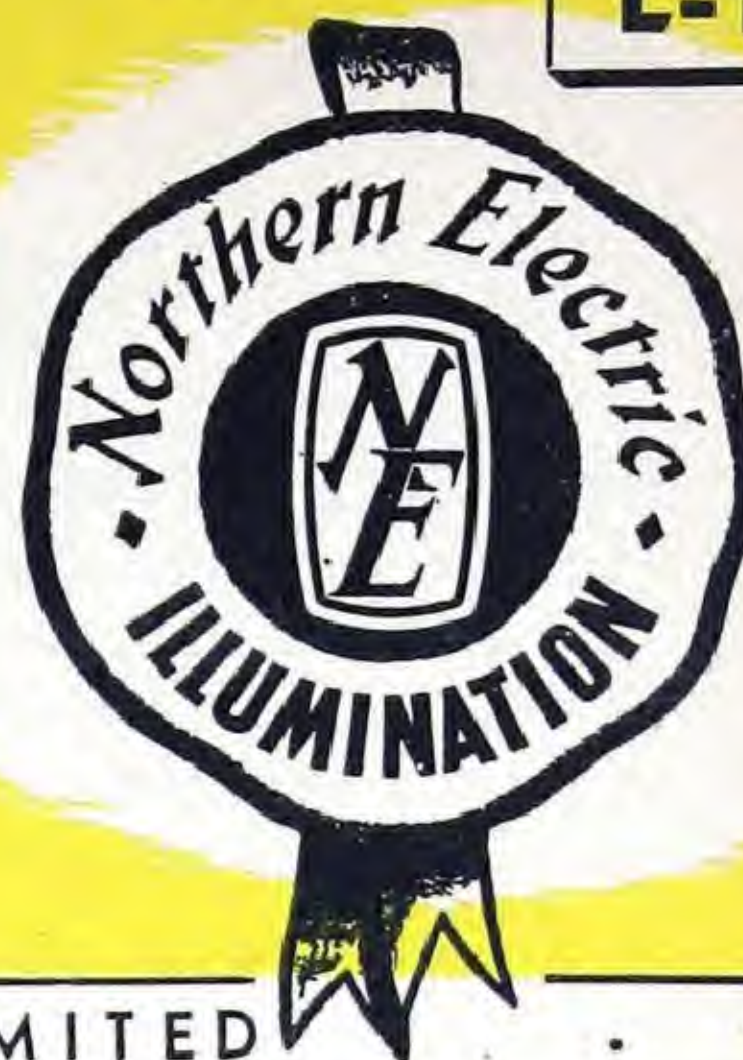
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# Nor-Lectric BULLETIN

October 1944

L-12-17



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## The SPEE-DEE Printer



*A Fast, Accurate, Easy-to-operate Printer which Duplicates at Small Cost in 30 Seconds*

### THREE EASY STEPS TO MAKING PERFECT PRINTS

- 1** Lift curtain and insert tracing with sensitized paper.
- 2** Close curtain by hooking curtain rod to holders. Set timer to desired number of seconds for print.
- 3** Remove and develop.

### MAKES BLUE PRINTS OR BLACK and WHITE PRINTS

Black and white prints need only one application of Directo developer or exposure in an ammonia tube. Finished prints are immediately ready for use. Blue prints are washed in water and potash and then must be dried or hung to dry.

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## *The SPEE-DEE Printer*

**THE SPEE-DEE PRINTER** is supplied in two sizes which have capacities for prints up to 12" x 18" and 18" x 24". The front page illustration shows a 12" x 18" Spee-Dee Printer with two 11" x 18½" prints inserted. The actual printing surface is oversize, as is the printing surface of the 18" x 24" printer. This prevents the crowding of prints, overlapping, or blurred edges. Printing on a curved glass surface gives perfect contact without the inconvenience of wrapping the prints around a cylinder. The Spee-Dee Printer is equipped with No. 2 Photo Flood Lamps and an automatic timer will be supplied when specified.

No special wiring required. Simply plug into any standard electric outlet.

## *B-1 and B-2 Table Type Continuous Printer*



produce clear sharp prints up to 44" wide in any lengths at speeds up to three feet a minute. They are equipped with mercury vapor lamps and special super-clear hand polished contact glass which is 25% more efficient in transmission than ordinary glass.

The tubular mercury vapor lamps are mounted horizontally to give absolutely uniform light intensity overall. They light instantly and give top performance.

The B-1 model is a single tube 420-watt printer, the B-2 model is a two-tube 820-watt printer.

These printers have a wide range of speeds controlled by a constant current rheostat. No lubrication is necessary. Finished in durable baked enamel.

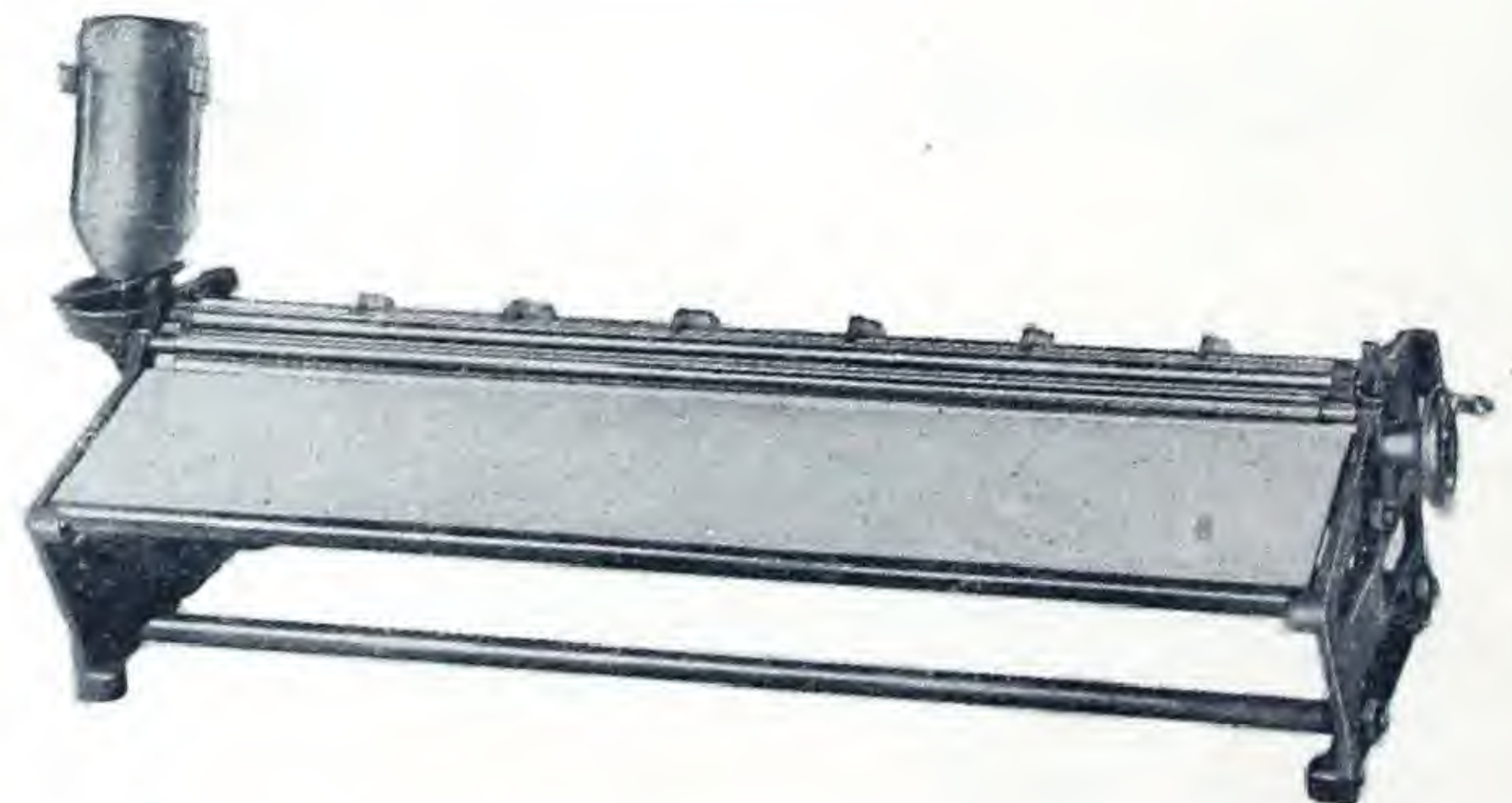
No special wiring is required. Simply plug into any standard electric outlet.

## *Directo Developers*

Strong, brilliant, contrasting prints are made with the utmost rapidity. Uniform high quality whether one print or hundreds are made. For use in drafting offices, factories, engineering projects, schools and offices. Developing time is only 10 seconds. Prints are immediately ready for use.

MODEL 4370-AH 12" wide. Hand-driven.

MODEL 4370-DH 24" wide. Hand-driven.



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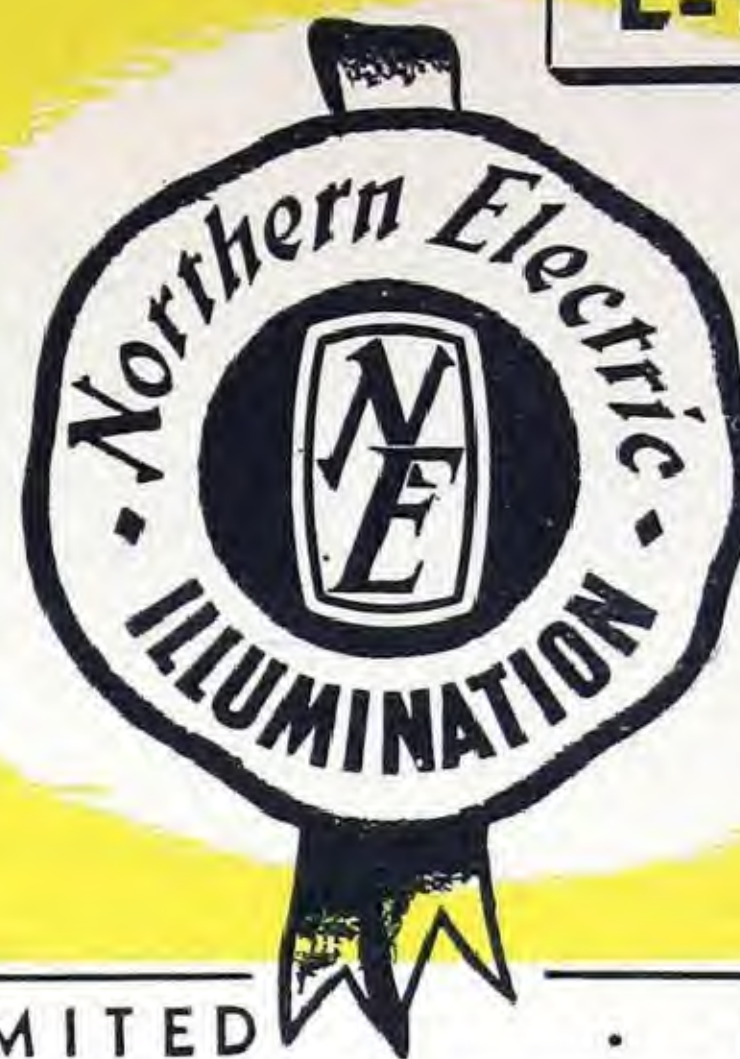
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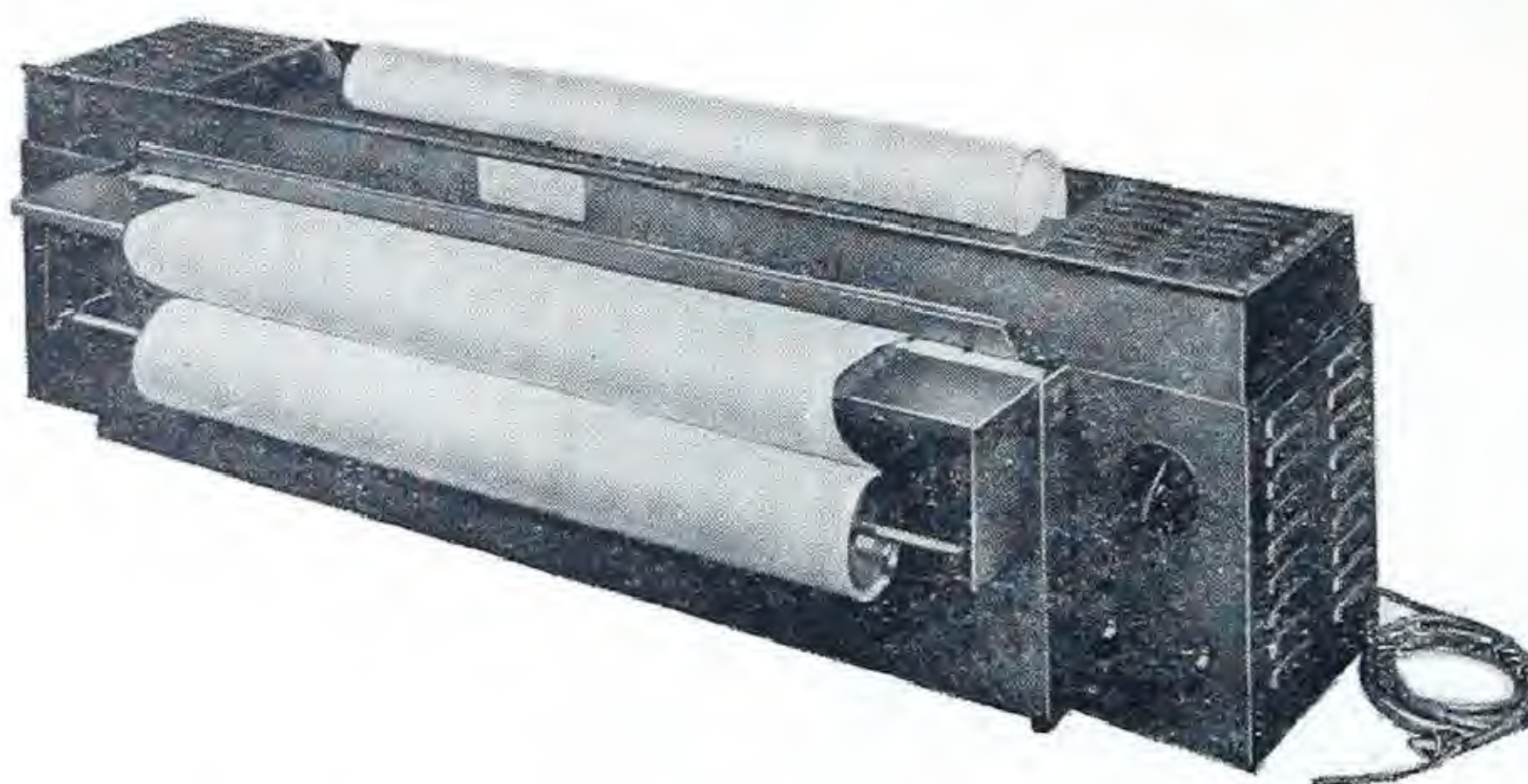


## The SPEE-DEE Printer

**THE SPEE-DEE PRINTER** is supplied in two sizes which have capacities for prints up to 12" x 18" and 18" x 24". The front page illustration shows a 12" x 18" Spee-Dee Printer with two 11" x 18½" prints inserted. The actual printing surface is oversize, as is the printing surface of the 18" x 24" printer. This prevents the crowding of prints, overlapping, or blurred edges. Printing on a curved glass surface gives perfect contact without the inconvenience of wrapping the prints around a cylinder. The Spee-Dee Printer is equipped with No. 2 Photo Flood Lamps and an automatic timer will be supplied when specified.

No special wiring required. Simply plug into any standard electric outlet.

## B-1 and B-2 Table Type Continuous Printer



produce clear sharp prints up to 44" wide in any lengths at speeds up to three feet a minute. They are equipped with mercury vapor lamps and special super-clear hand polished contact glass which is 25% more efficient in transmission than ordinary glass.

The tubular mercury vapor lamps are mounted horizontally to give absolutely uniform light intensity overall. They light instantly and give top performance.

The B-1 model is a single tube 420-watt printer, the B-2 model is a two-tube 820-watt printer.

These printers have a wide range of speeds controlled by a constant current rheostat. No lubrication is necessary. Finished in durable baked enamel.

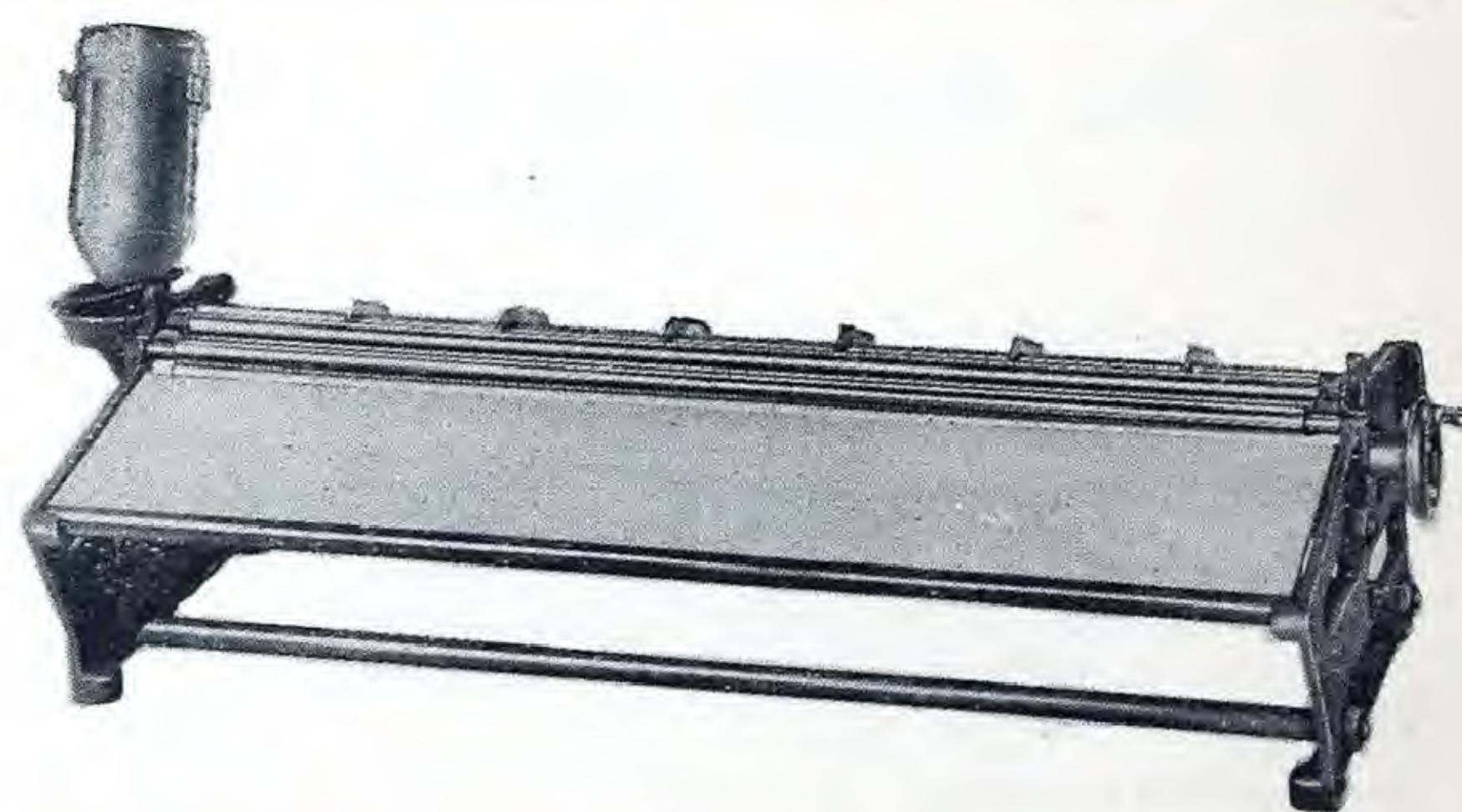
No special wiring is required. Simply plug into any standard electric outlet.

## Directo Developers

Strong, brilliant, contrasting prints are made with the utmost rapidity. Uniform high quality whether one print or hundreds are made. For use in drafting offices, factories, engineering projects, schools and offices. Developing time is only 10 seconds. Prints are immediately ready for use.

MODEL 4370-AH 12" wide. Hand-driven.

MODEL 4370-DH 24" wide. Hand-driven.



# Northern Electric

COMPANY LIMITED

A NATIONAL ELECTRICAL SERVICE

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## Model TS-41 Time Switch

### FOR ALTERNATING CURRENT ONLY



Fig. 1

The Inter-Matic Time Switch is designed to meet the ever increasing demand for a reliable low priced time switch for single cycle operations such as controlling signs, store window lighting, flood lighting, apartment or hotel lobby lights, poultry house lights, etc., where only one automatic "on" and "off" operation is required in any 24 hour period. No attempt was made to compromise the design to cover a wide range of applications because additional parts needed for special problems simply add to the cost and serve no useful function when the time switch is used for single cycle applications. Thus, by not attempting to make an all purpose model, but by producing a time switch for a definite purpose and eliminating all non-essential features it is possible to have high quality at a low price. How well this has been accomplished is indicated by the specifications shown below.

### Specifications

- 1 SWITCH: Single pole, single throw. 35 amperes at 115 volts. Large, silver, snapaction contacts.
- 2 TIMING MOTOR: Self-starting, slow speed, high torque, synchronous, quiet, fully enclosed, permanently lubricated. Indicator shows whether motor is running or not.
- 3 TIME DIAL: Large numbers, clearly defined time divisions, easily set. Time setting visible through window in cover.
- 4 TIMING RANGE: Minimum 15 minutes. Maximum 21 hours.
- 5 MANUAL CONTROL: The switch may be turned "on" or "off" manually whenever desired, irrespective of the time settings.
- 6 AUTOMATIC RESET: Regardless of whether the switch has been turned "on" or "off" manually, the time cycle is always resumed automatically.
- 7 TERMINAL BLOCK: Clearly marked, large terminal screws.
- 8 KNOCKOUTS: Combination  $\frac{1}{2}$ " and  $\frac{3}{4}$ ", one in the back, two in the bottom, one on each side.
- 9 CASE: Drawn steel, round corners,  $7\frac{3}{4}$ " high, 5" wide, 3" deep, finished in black enamel. Not water proof. Spring hasp holds door closed.
- 10 ACCESSIBILITY: Entire mechanism may be removed by loosening one screw. All parts easily replaced.
- 11 LOCATION: May be used either out or indoors. If used outdoors the time switch must be protected from the weather by some suitable additional housing.



### HOW TO SET THE TIME DIAL

The twenty-four hour time dial S, Figure 2, is divided into a twelve hour black section for night (6 o'clock P.M. to 6 o'clock A.M.) and a twelve hour white section for day (6 o'clock A.M. to 6 o'clock P.M.). The hours are clearly marked by numbers. Quarter hour subdivisions are shown by short radial lines between the hour markings. The dial S is set for the time of day by turning it in a clockwise direction until the correct time of day as shown on the dial is in line with the pointer T marked TIME. Caution: Do not turn the time dial counter-clockwise.

### HOW TO SET "ON" AND "OFF" POINTERS

The "ON" pointer C, Figure 2, is marked "ON." The "OFF" pointer W is marked "OFF." In order to have the time switch turn the current on and off at the desired time the "ON" pointer must be set to the desired "ON" time and the "OFF" pointer must be set to the desired "OFF" time on the time dial. Always set the "ON" pointer first. To set the pointers loosen the knurled screws and simply move each pointer in a clockwise direction until it is opposite the desired time. As each pointer is set, tighten its knurled screw very firmly.

### HOW TO OPERATE THE MANUAL CONTROL

The manual control is operated by an "ON" button shown at D, Figure 2, and an "OFF" button shown at H. By means of these buttons the following operations are performed:

- 1 If, for example, during an "off" period it is desired to close the controlled circuit, it is only necessary to push the manual "ON" button D as far as it will go. The time switch contacts will close at once and will remain closed until the end of the normal "on" period or until the manual "OFF" button H is operated.
- 2 If, for example, during an "on" period it is desired to open the controlled circuit, it is only necessary to push the manual "OFF" button H as far as it will go. The time switch contacts will open at once and will remain open until the end of the normal "off" period or until the manual "ON" button D is operated.

### HOW TO REMOVE AND REPLACE MECHANISM

To remove the mechanism from the case simply loosen the screw R Figure 2, slide locking member Q from under lug P and lift up the entire mechanism. To replace the mechanism slide the lower end of the mechanism plate B between the lugs K and I on the sides of the case, lower the top of the plate into the case, slide the locking member Q under the lug P and tighten screw R securely.

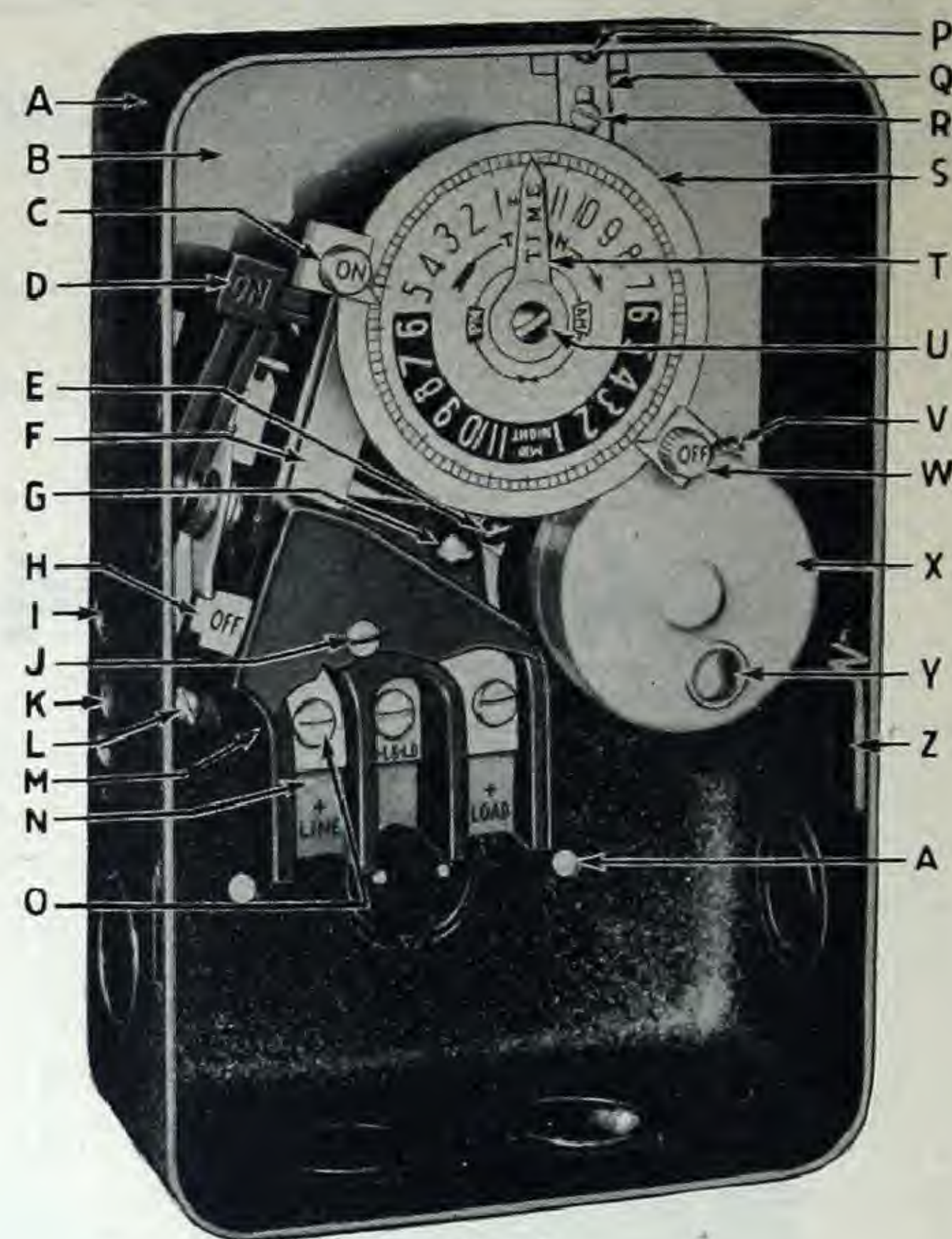


Fig. 2

### HOW TO CONNECT THE TIME SWITCH

Fasten the line and load wires to the line and load terminals respectively. These terminals are clearly marked as shown in Figure 2. Large terminal screws O are provided to facilitate connections.

**CAUTION:** The type of current and maximum load for which the time switch is intended is plainly marked on the name plate on the outside of the door. Be sure this corresponds with the load and current being connected before making connections.

### HOW TO MOUNT THE TIME SWITCH

Three mounting holes are provided for fastening the switch on a panel or wall. It is not necessary to remove the mechanism from the case. A round head screw with a head slightly smaller than the larger part of the upper hole is recommended for the upper mounting screw. Drive this screw almost all the way into the wall. Hook the upper mounting hole over this screw head, pull the case down as far as it will go and then fasten the lower mounting screws from the inside of the case.

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NOR-ELECTRIC



BULLETIN

24

POWER APPARATUS DEPARTMENT

VENTILATION

THE AIR YOU BREATHE SHOULD BE  
AS PURE AS THE WATER YOU DRINK!



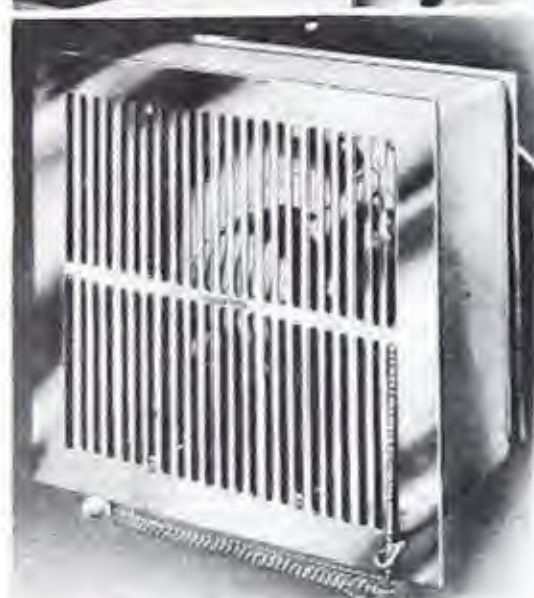
ILG

VENTILATION





## ELECTRIC VENTILATION FOR THE HOME



THREE SIZES—8" Ilgvent (above) for small kitchens; 10" Ilgette (left) for average-size kitchens; 12" Ilgair for larger kitchens.

### "BUILT-IN" MODELS...

Streamlined, modern unit becomes an integral, permanent part of the building wall. Simple, easy to install by contractor in new or remodeled homes or apartments.

**WEATHERPROOF**—one-piece, weather-tight door on outside of house is opened or closed by beaded pull chain, simultaneously causing fan motor to start or stop. Keeps out insects and cold air when fan is not operating.

**QUIET**—operates smoothly, freely, without effort for years on end. Fan wheel is so accurately balanced, allowance is even made for minute variations in paint coverage! Rugged framework keeps moving parts aligned, assures a solid, permanent installation, minimizes vibration.

**TELESCOPIC CABINETS**—(made of 16-gauge rust-resisting steel) permitting depth adjustment for different wall thicknesses.

**AUTOMATIC BUILT-IN ILGETTE**—equipped with an auxiliary small motor in place of pull chain, this model can be operated by an electrical wall switch.



THREE SIZES—8" Ilgvent for small, compact kitchens; 10" Ilgette for average-size kitchens; 12" Ilgair for larger size kitchens.



### "PORTABLE" MODELS

For window frame installation, or for installations where wall space or room arrangement does not permit use of a "Built-in" Model. Fits any ordinary window, requiring only four screws and a few moments work for complete installation, either by home-maker or by local electrician. Can be moved quickly and easily to a new home. Mounted on window frame, back of sash, permitting window to be locked, opened, or closed at will, never interfering with curtains. Plugs in to nearest electrical outlet. Fan is sturdily mounted in all-steel Ivory finish adjustable panel. Each model complete with 10 foot cord, plug, pull chain and sash lifting handles.



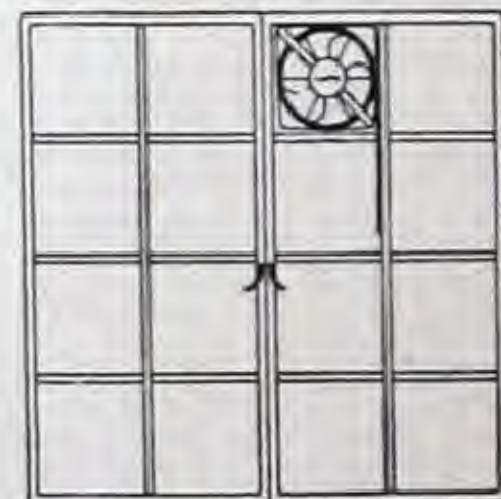
TWO SIZES—8" Ilgvent for small kitchens; 10" Ilgette for medium-size kitchens.

### "PACKAGE-TYPE" MODELS...

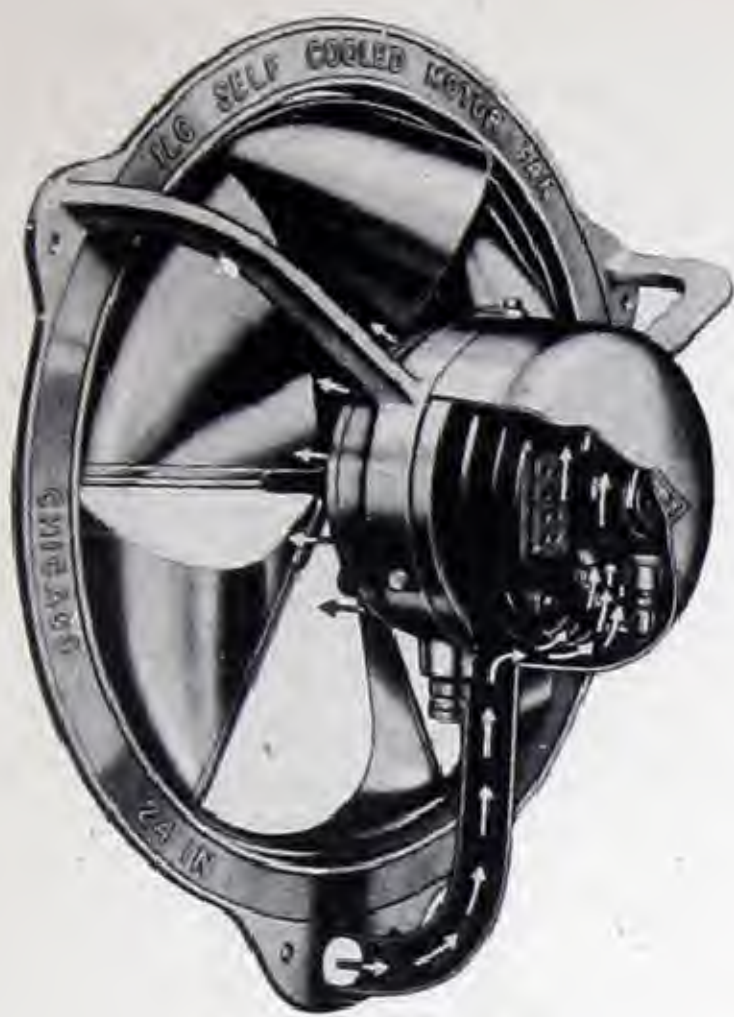
Permanently installs in steel sash window or other small panel window, with unit replacing one pane of glass, as indicated in drawing. Can also be used in double hung windows with wood or metal mullions around panel. 8" Ilgvent model has fixed depth cabinet ( $3\frac{3}{8}$ " ) for use in thin wall applications.

Beaded pull chain opens and closes weather-tight outer door simultaneously starting and stopping fan operation.

**NOTE**—Electric Ventilators pictured here in kitchens can be used for ventilation of bathrooms, laundry and recreation rooms. All models are listed by Underwriters' Laboratories, Inc. Ratings are certified.







## SELF-COOLED MOTOR PROPELLER FANS FOR BUSINESS AND INDUSTRY

Exclusive, patented ILG Self-Cooled Motor is pictured at left. When fan is operating, clean, cool, fresh air is drawn through the vent pipe from OUTSIDE, circulated through motor, then exhausted from front of motor. Motor stays clean, cools itself—no foul air reaches it to interrupt service, shorten its life.

A ready market will be found in commercial and industrial applications of these internationally-known exhaust fans. Available in all popular sizes up through 23,200 CFM capacity. Readily installed in wall, window, monitors, or in pent-house on roof to rapidly remove bad air, smoke, steam, dust, vapours. Quiet, powerful, with ratings certified, they are backed by ILG'S "One-Name-Plate" responsibility covering both motor and fan. They can be sold with confidence that they will give satisfaction over a long period of years.



OFFICES need ventilation to remove smoke, odours, excess heat, "used" air. Workers in fresh, clean, rapidly changed air experience less fatigue, commit fewer errors, have higher morale. Quick, powerful operation of ILG Fan makes possible installation in close proximity to working area.



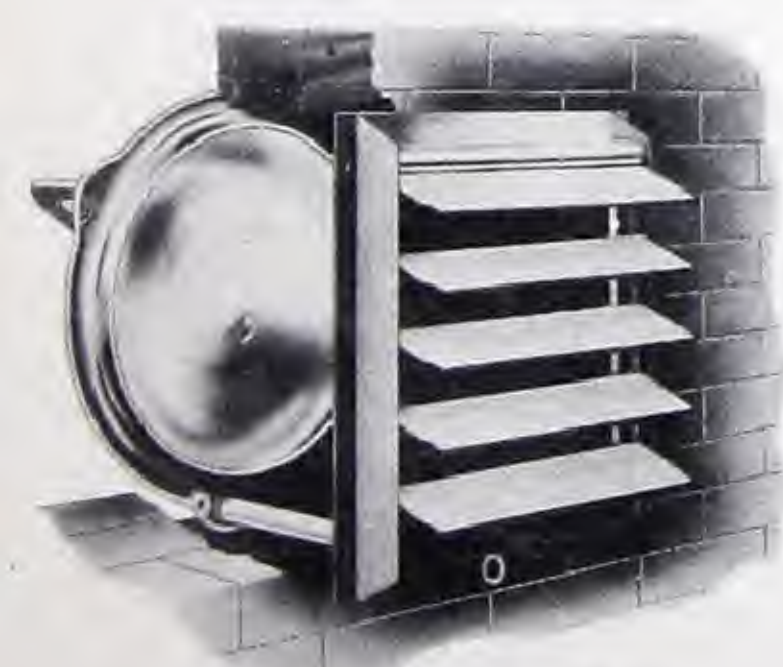
FACTORY MANAGERS can attract better workers, and increase output per man-hour, by providing a fresh, clean atmosphere. ILG rapid air change drives out foul air, steam, vapours, smoke, dust and excess heat, as it brings in fresh, invigorating air. Similar installations can be made in stores, garages, etc.



## AUTOMATIC SHUTTERS

To protect the propeller fan and interior of the building from rain and snow, an ILG Automatic Shutter is recommended for installation on the exhaust side of the fan, flush with the exterior of the building.

The ILG Automatic Shutter is acknowledged to be the leader in simplicity of design, dependability of operation, economy and complete weather protection.



FAN RUNNING



FAN NOT RUNNING





## CENTRIFUGAL BLOWERS

### TYPE "B" VOLUME BLOWERS...

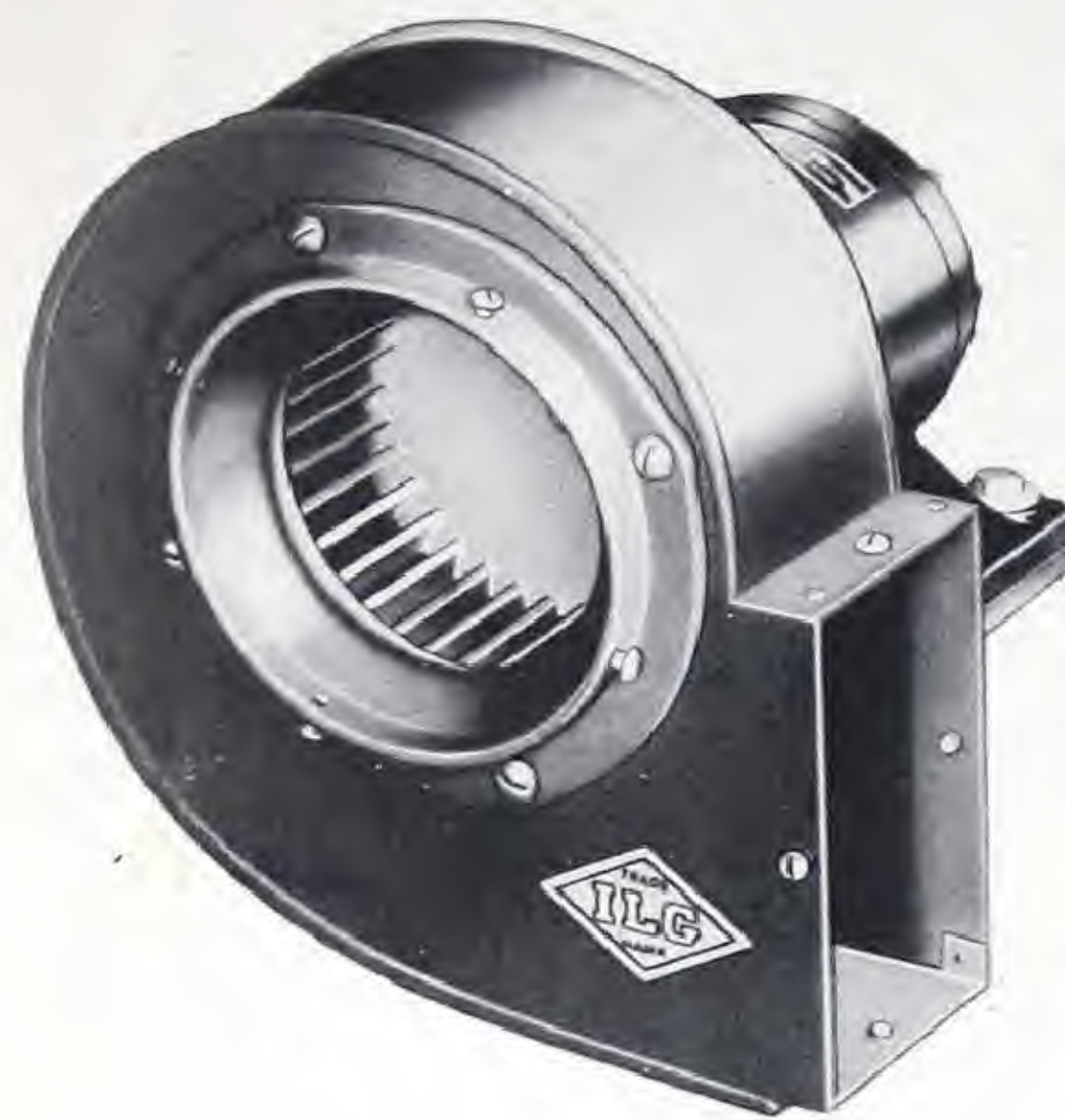
**USE**—particularly adapted for applications in offices, toilets, projection booths, telephone booths, kitchens, etc., where it is necessary to handle air through ducts.

**HIGH RATINGS, LOW COST**—design of Type "B" Volume Blowers is highly advanced. Size for size, speed for speed, they will deliver more air at a given static pressure, at lower power cost, than most other small types of blowers.

**DIRECT-CONNECTED**—housing and motor are mounted on a common base, with blower wheel mounted directly on motor shaft to save space, reduce installation, operating and maintenance costs.

**SIMPLIFIES INSTALLATION**—Die-cut steel housing has streamlined inlet and outlet openings, both of which are flanged and provided with bolts for attachment of duct-work. Removal of inlet flange permits quick removal of wheel through inlet. All sizes available with clockwise or counter-clockwise rotation and for any angle of discharge. Discharge can be changed at any time by removing the flange bolts, then rotating housing to the desired angle.

**TOP QUALITY**—construction. Blower wheel is dynamically balanced to insure smoothness of operation, freedom from vibration, practically noiseless operation. Inlet flange and base are cast-iron.



### TYPE "BC" WITH BACKWARD CURVED BLADES...

Load-limiting type for ventilating and air conditioning applications where static resistance may vary. Motor load remains constant over wide range of air volume and change in static pressure. No need for excess motor horsepower. No chance of motor overload where resistance is less than calculated. Motor and wheel are permanently aligned by mounting wheel on motor shaft, avoiding money-wasting friction from belts, gears or sheaves... permitting partial recession of motor in side of casing to save floor space. Mount on floor, wall or ceiling. Universal discharge. "One-Name-Plate" Guarantee. 10 sizes. Also available for belt drive.



#### Variable Air Controller

Manually or electrically operated for efficient control of air volume on alternating current. No waste of power from variable motor speed. Simple, compact, sturdy. Extra equipment.



#### "Floated Drive" Brackets

For extremely quiet operation. Motor mounting rides on rubber cushions, eliminating noise and vibration of metal-to-metal contact. Available as extra equipment on all types ILG Centrifugal Fans.



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 KINGSTON TORONTO HAMILTON LONDON WINDSOR KIRKLAND LAKE TIMMINS SUDBURY  
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